04

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

AND

SPECIAL PROVISIONS

FOR CONSTRUCTION ON STATE HIGHWAY IN ALAMEDA COUNTY IN OAKLAND FROM 1.6 KM WEST OF THE TOLL PLAZA TO 0.3 KM WEST OF THE TOLL PLAZA

In District 04 On Route 80

Under

Bid book dated March 12, 2012	**Standard Specifications dated 1999**
Project Plans approved	**Standard Plans dated 2004**

Identified by

Contract No. 04-0120M4

04-Ala-80-1.6/2.7

Project ID 0400000022

Electronic Advertising Contract

Bids open Wednesday, March 21, 2012 OSD

Dated March 12, 2012 IH

****

SPECIAL NOTICES

****

- Effective July 6, 2010, the Department will receive bids for projects in Districts 1 through 6, 9, and 10 at 1727 30th Street, Bidders' Exchange, MS 26, Sacramento, CA 95816. Refer to the Notice to Bidders for this project's bid opening date, time, and location.

- The Department has changed its DVBE requirements. Refer to section titled "Disabled Veteran Business Enterprises" in Section 2, "Bidding," of these special provisions.

- The Department is providing an electronic Information Handout for this project. Refer to Section 2-1.03B, "Supplemental Project Information," in the Amendments to the Standard Specifications for the location of this information.

- The Department is allowing contractors to submit electronic payroll records to the District Labor Compliance Office. Refer to section titled "Electronic Submission of Payroll Records" under Section 5, "General," of these special provisions.

- See Section 4, “Beginning of Work, Time of Completion, and Liquidated Damages” regarding special requirements for beginning of work and revised definition of “working day.”

CONTRACT NO. 04-0120M4

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

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STANDARD PLANS LIST

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

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S92	Overhead Formed Sign Panel
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 S102	Overhead Sign – Truss, Single Post Type, Structural Frame Details, Unbalanced Butterfly Changeable Message Signs, Model 500
RSP S103	Overhead Sign – Truss, Single Post Type, Plan and Upper Bolt Details, Unbalanced Butterfly Changeable Message Signs, Model 500
S104	Overhead Sign – Truss, Single Post Type, Frame Juncture Details, Unbalanced Butterfly

	Changeable Message Signs, Model 500
RSP S109	Overhead Sign – Truss, Single Post Type, Layout, Full Cantilever Changeable Message Signs, Model 500
RSP S110	Overhead Sign – Truss, Single Post Type, Structural Frame Details, Full Cantilever Changeable Message Signs, Model 500
RSP S111	Overhead Sign – Truss, Single Post Type, Plan and Upper Bolt Details, Full Cantilever Changeable Message Signs, Model 500
S112	Overhead Sign – Truss, Single Post Type, Frame Juncture Details, Full Cantilever Changeable Message Signs, Model 500
RSP S113	Overhead Sign – Truss, Single Post Type, Mounting Details, Changeable Message Signs, Model 500
RSP S114	Overhead Sign – Truss, Single Post Type, Walkway Details, Changeable Message Signs, Model 500
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-2C	Electrical Systems (Service Equipment Notes, Type III Series)
RSP ES-2D	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – A Series)
ES-3A	Electrical Systems (Controller Cabinet Details)
RSP ES-3C	Electrical Systems (Controller Cabinet Details)
RSP ES-3H	Electrical Systems (Irrigation Controller Enclosure Cabinet)
ES-6J	Electrical Systems (Lighting Standards – 24.4 m to 48.8 m High Mast Light Pole Foundation Details)
RSP ES-8	Electrical Systems (Pull Box Details)
RSP ES-9C	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-16A	Electrical Systems (Closed Circuit Television Pole Details)
RSP ES-16C	Electrical Systems (Closed Circuit Television – 18.2 m to 27.4 m High Mast Pole, Foundation Details)

NOTICE TO BIDDERS

Bids open Wednesday, March 21, 2012

Dated March 12, 2012

General work description: Construct bridges and roadway, and Electrical System.

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN ALAMEDA COUNTY IN OAKLAND FROM 1.6 KM WEST OF THE TOLL PLAZA TO 0.3 KM WEST OF THE TOLL PLAZA.

District-County-Route-Kilometer Post: 04-Ala-80-1.6/2.7

Contract No. 04-0120M4

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

The Department establishes no DVBE Contract goal but encourages bidders to obtain DVBE participation.

Bids must be on a cost+time basis, based on the sum of the item totals and the total bid for time to complete Designated Portion of Work 1. Complete Designated Portion of Work 1 within the number of working days bid. Do not bid more than 300 working days for Designated Portion of Work 1.

Complete the work within 1140 working days. The estimated cost of the project is $43,000,000.

The Department will receive bids until 2:00 p.m. on the bid open date at 1727 30th Street, Bidders' Exchange, MS 26, Sacramento, CA 95816. Bids received after this time will not be accepted. Department staff will direct the bidders to the bid opening.

The Department will open and publicly read the bids at the above location immediately after the specified closing time. District office addresses are provided in the Standard Specifications.
Bidders' inquiries may be presented to the Department by following the instructions at:

The Department posts responses to the questions at the District Web sites.

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

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

Under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq., the Department gives preference to certified small businesses and non-small businesses who commit to 25 percent certified small business participation.

Under Pub Cont Code § 6107, the Department gives a reciprocal preference to a California company for bid comparison purposes over a nonresident contractor from any state that provides a preference to contractors from that state on construction contracts.

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

The Department has made available Notices of Suspension and Proposed Debarment from the Federal Highway Administration. For a copy of the notices go to Additional information is listed in the Excluded Parties List System at httpv.

DEPARTMENT OF TRANSPORTATION

AOO

COPY OF BID ITEM LIST

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	780
3	071325	TEMPORARY FENCE (TYPE ESA)	M	1280
4	074016	CONSTRUCTION SITE MANAGEMENT	LS	LUMP SUM
5	074018	HEALTH AND SAFETY PLAN	LS	LUMP SUM
6	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
7	022005	TURBIDITY CONTROL	LS	LUMP SUM
8	074028	TEMPORARY FIBER ROLL	M	4400
9	074029	TEMPORARY SILT FENCE	M	3300
10	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	8
11	074034	TEMPORARY COVER	M2	4430
12	074035	TEMPORARY CHECK DAM	M	100
13	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	8
14	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	57
15	074040	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	M2	17 700
16	074041	STREET SWEEPING	LS	LUMP SUM
17	074043	TEMPORARY CONCRETE WASHOUT BIN	EA	58
18	074056	RAIN EVENT ACTION PLAN	EA	150
19	074057	STORM WATER ANNUAL REPORT	EA	5
20	074058	STORM WATER SAMPLING AND ANALYSIS DAY	EA	56

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	022006	DEWATERING AND NON-STORM WATER DISCHARGECONTROL	LS	LUMP SUM
22	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
23	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
24	120159	TEMPORARY TRAFFIC STRIPE (PAINT)	M	2400
25	120165	CHANNELIZER (SURFACE MOUNTED)	EA	8
26	120300	TEMPORARY PAVEMENT MARKER	EA	580
27	128650	PORTABLE CHANGEABLE MESSAGE SIGN	LS	LUMP SUM
28	129000	TEMPORARY RAILING (TYPE K)	M	420
29	129150	TEMPORARY TRAFFIC SCREEN	M	420
30	150206	ABANDON CULVERT	M	650
31	150221	ABANDON INLET	EA	4
32	150608	REMOVE CHAIN LINK FENCE	M	36
33	150620	REMOVE GATE	EA	4
34	150662	REMOVE METAL BEAM GUARD RAILING	M	70
35	141103	REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE (HAZARDOUS WASTE)	M	150
36	150714	REMOVE THERMOPLASTIC TRAFFIC STRIPE	M	2030
37	150715	REMOVE THERMOPLASTIC PAVEMENT MARKING	M2	4
38	150742	REMOVE ROADSIDE SIGN	EA	34
39	150760	REMOVE SIGN STRUCTURE	EA	2
40	150805	REMOVE CULVERT	M	930

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	022007	REMOVE ASBESTOS CEMENT PIPE	M	230
42	150820	REMOVE INLET	EA	44
43	150846	REMOVE CONCRETE PAVEMENT	M3	130
44	150860	REMOVE BASE AND SURFACING	M3	5320
45	022008	SALVAGE QWICK KURB CHANNELIZER SYSTEM	M	380
46	022009	RECONSTRUCT ROCK SLOPE PORTECTION (1T, METHOD B)	M3	310
47	152386	RELOCATE ROADSIDE SIGN-ONE POST	EA	3
48	152387	RELOCATE ROADSIDE SIGN-TWO POST	EA	4
49	022010	SEWER VIDEO SURVEY	LS	LUMP SUM
50	022011	VIBRATION MONITORING	LS	LUMP SUM
51	022012	PHOTO SURVEY OF EXISTING FACILITIES	LS	LUMP SUM
52	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	M2	19 900
53 (F)	153225	PREPARE CONCRETE BRIDGE DECK SURFACE	M2	4210
54	153229	REMOVE CONCRETE BARRIER (TYPE K)	M	2380
55	022013	REMOVE CONCRETE BARRIER (TYPE 60SC)	M	340
56	153235	CLEAN BRIDGE DECK	M2	113 300
57	155003	CAP INLET	EA	1
58	156590	REMOVE CRASH CUSHION (SAND FILLED)	EA	1
59	157561	BRIDGE REMOVAL (PORTION), LOCATION A	LS	LUMP SUM
60	157562	BRIDGE REMOVAL (PORTION), LOCATION B	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61	157563	BRIDGE REMOVAL (PORTION), LOCATION C	LS	LUMP SUM
62	157564	BRIDGE REMOVAL (PORTION), LOCATION D	LS	LUMP SUM
63	480501	JACKING SUPERSTRUCTURE	LS	LUMP SUM
64	160101	CLEARING AND GRUBBING	LS	LUMP SUM
65	190101	ROADWAY EXCAVATION	M3	32 400
66	022014	ROADWAY EXCAVATION (TYPE H)	M3	11 200
67	022046	ROADWAY EXCAVATION (CLASS II)	M3	58
68	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
69	190113	ASBESTOS COMPLIANCE PLAN	LS	LUMP SUM
70	022015	CONTAMINATED MATERIAL SAMPLING AND ANALYSIS	LS	LUMP SUM
71	022016	ASBESTOS INSPECTION (BRIDGE REMOVAL)	LS	LUMP SUM
72 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	194
73	022017	STRUCTURE EXCAVATION (DUCT BANK)	M3	1630
74 (F)	192023	STRUCTURE EXCAVATION (TYPE H)	M3	163
75 (F)	022018	STRUCTURE EXCAVATION (CLASS II)	M3	325
76	022019	STRUCTURE BACKFILL (RSP)	M3	320
77 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	615
78	022020	STRUCTURE BACKFILL (DUCT BANK)	M3	1300
79	198009	IMPORTED BORROW (LIGHTWEIGHT AGGREGATE)	M3	530
80	022021	LIGHTWEIGHT EMBANKMENT MATERIAL (CELLULAR CONCRETE)	M3	30 000

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	200001	HIGHWAY PLANTING	LS	LUMP SUM
82	200101	IMPORTED TOPSOIL	M3	4930
83	200114	ROCK BLANKET	M2	780
84	203016	EROSION CONTROL (TYPE D)	M2	13 000
85	203018	EROSION CONTROL (NETTING)	M2	1750
86	203021	FIBER ROLLS	M	1460
87	203025	COMPOST (INCORPORATE)	M2	600
88	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	12
89	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
90	208000	IRRIGATION SYSTEM	LS	LUMP SUM
91	022022	NPS 4 AIR LINE (BRIDGE)	M	130
92	022023	NPS 10 SEWER LINE (BRIDGE)	M	170
93	022024	NPS 18 SEWER CASING PIPE (BRIDGE)	M	150
94	022025	150 MM PLASTIC PIPE (SCHEDULE 40) IRRIGATION SLEEVE	M	60
95	208731	200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	53
96	208733	300 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	5
97	260201	CLASS 2 AGGREGATE BASE	M3	8190
98	022026	DECOMPOSED GRANITE	M3	94
99	260301	CLASS 3 AGGREGATE BASE	M3	550
100	390131	HOT MIX ASPHALT	TONN	16 000

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101	390134	HOT MIX ASPHALT (OPEN GRADED)	TONN	3130
102	394060	DATA CORE	LS	LUMP SUM
103	397001	ASPHALTIC EMULSION (PAINT BINDER)	TONN	21
104	397005	TACK COAT	TONN	57
105	043452	FURNISH PRECAST PRESTRESSED PILING (0.610 M OCTAGONAL)	M	1327
106	043453	DRIVE PRECAST PRESTRESSED PILE (0.610 M OCTAGONAL)	EA	49
107	499022	FURNISH CAST-IN-STEEL-SHELL CONCRETE PILING (406 MM)	M	248
108	499023	DRIVE CAST-IN-STEEL-SHELL CONCRETE PILE (406 MM)	EA	12
109	043454	MICROPILE	EA	23
110	043455	PRESTRESSING, LONGITUDINAL	LS	LUMP SUM
111	043456	PRESTRESSING, TRANSVERSE	LS	LUMP SUM
112 (F)	043457	LEVELING CONCRETE	M3	54
113 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	172
114 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	2944
115 (F)	043458	STRUCTURAL CONCRETE, BIKEPATH	M3	172
116 (F)	510072	STRUCTURAL CONCRETE, BARRIER SLAB	M3	188
117 (F)	043459	OVERHEAD SIGN FOUNDATION	EA	2
118 (F)	043460	UTILITY VAULT	EA	1
119 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	M3	70
120 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	329

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121	510526	MINOR CONCRETE (BACKFILL)	M3	11
122 (F)	511064	FRACTURED RIB TEXTURE	M2	72
123	043461	EPOXY GROUT DOWEL	M	1675
124	043462	FURNISH PRECAST CONCRETE SLAB (BIKEPATH)	EA	42
125	043463	ERECT PRECAST CONCRETE SLAB (BIKEPATH)	EA	42
126 (F)	043464	FURNISH PRECAST CONCRETE SLAB	EA	1
127 (F)	043465	ERECT PRECAST CONCRETE SLAB	EA	1
128 (F)	043466	PRECAST WALL (TYPE 1)	M2	168
129 (F)	043467	PRECAST WALL (TYPE 2)	M2	660
130 (F)	043468	FURNISH POLYESTER CONCRETE OVERLAY (12 MM)	M3	35
131 (F)	043469	PLACE POLYESTER CONCRETE OVERLAY (12 MM)	M2	2895
132 (F)	043470	FURNISH POLYESTER CONCRETE OVERLAY (20 MM)	M3	53
133 (F)	043471	PLACE POLYESTER CONCRETE OVERLAY (20 MM)	M2	2664
134	515074	CORE CONCRETE (101 MM - 150 MM)	M	100
135 (F)	518051	PTFE SPHERICAL BEARING	EA	10
136	043526	INSTALL SEISMIC JOINT (ABUTMENT E 23R)	LS	LUMP SUM
137	043474	BIKEPATH EXPANSION JOINT	M	12
138	043475	INSTALL MODULAR JOINT SEAL ASSEMBLY	EA	1
139 (F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	620 000
140 (F)	520110	BAR REINFORCING STEEL (EPOXY COATED) (BRIDGE)	KG	3550

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
141 (F)	043476	BAR REINFORCING STEEL (BARRIER SLAB)	KG	13 500
142 (F)	520120	HEADED BAR REINFORCEMENT	EA	4920
143 (F)	540102	TREAT BRIDGE DECK	M2	113 285
144	540108	FURNISH BRIDGE DECK TREATMENT MATERIAL	L	51 495
145 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	20 892
146 (F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	20 892
147	560233	FURNISH FORMED PANEL SIGN (OVERHEAD)	M2	71
148	560238	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED)	M2	17
149	560242	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-FRAMED)	M2	8
150	562002	METAL (BARRIER MOUNTED SIGN)	KG	240
151	566011	ROADSIDE SIGN - ONE POST	EA	21
152	566012	ROADSIDE SIGN - TWO POST	EA	1
153	568016	INSTALL SIGN PANEL ON EXISTING FRAME	M2	54
154	022027	DIRECTIONAL SIGN	EA	2
155	641132	300 MM PLASTIC PIPE	M	63
156	641134	450 MM PLASTIC PIPE	M	620
157	641136	600 MM PLASTIC PIPE	M	500
158	665733	450 MM SLOTTED CORRUGATED STEEL PIPE (2.01 MM THICK)	M	21
159	682045	CLASS 3 PERMEABLE MATERIAL	M3	2.7
160	022028	300 MM PLASTIC FLARED END SECTION	EA	3

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
161	022029	450 MM PLASTIC FLARED END SECTION	EA	1
162	727901	MINOR CONCRETE (DITCH LINING)	M3	110
163	022030	GEOTEXTILE FILTER FABRIC	M2	470
164	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	330
165 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	5040
166 (F)	750498	MISCELLANEOUS METAL (RESTRAINER - CABLE TYPE)	KG	330
167 (F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	28 420
168 (F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	4200
169	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	500
170	820107	DELINEATOR (CLASS 1)	EA	22
171	820141	OBJECT MARKER (TYPE K-1)	EA	7
172	022031	WELDED WIRE STEEL RAILING	M	870
173 (F)	043477	BIKEPATH RAILING	M	624
174	839521	CABLE RAILING	M	93
175	839631	CRASH CUSHION MODULE, SAND FILLED	EA	14
176	839710	CONCRETE BARRIER (TYPE 60S)	M	630
177	839712	CONCRETE BARRIER (TYPE 60SC)	M	1140
178 (F)	839717	CONCRETE BARRIER (TYPE 732 MODIFIED)	M	777
179	022032	75 MM BLACK THERMOPLASTIC TRAFFIC STRIPE	M	9720
180	840515	THERMOPLASTIC PAVEMENT MARKING	M2	230

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
181	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	25 200
182	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	170
183	840570	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 10.98 M - 3.66 M)	M	25 100
184	840571	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M)	M	1490
185	022033	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.05 M - 1.52 M)	M	97
186	840656	PAINT TRAFFIC STRIPE (2-COAT)	M	3180
187	840666	PAINT PAVEMENT MARKING (2-COAT)	M2	44
188	842000	PARKING BUMPER (PRECAST CONCRETE)	EA	43
189	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	6960
190	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	3110
191	022034	ROADWAY AND GIRDER LEVEL EASTBOUND	LS	LUMP SUM
192	022035	UNDERGROUND AND ROADWAY AT GRADE	LS	LUMP SUM
193	022036	SCADA REMOTE TERMINAL UNIT SYSTEM	LS	LUMP SUM
194	022037	CALL BOX SYSTEM	LS	LUMP SUM
195	022038	STRONG MOTION DETECTION SYSTEM	LS	LUMP SUM
196	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
197	022039	FURNISH BIKEWAY LIGHTING LUMINAIRE	EA	17
198	022040	FURNISH BIKEWAY LIGHT POLE	EA	17
199	022041	TRAFFIC OPERATIONS SYSTEM	LS	LUMP SUM
200	022042	REMOVAL ELECTRICAL	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
201	022043	REMOVABLE BOLLARD	EA	4
202	022044	SERVICE PLATFORM	EA	1
203	994425	BENCH	EA	2
204	994901	TRASH RECEPTACLE	EA	2
205	999990	MOBILIZATION	LS	LUMP SUM

SPECIAL PROVISIONS

SECTION 1 (BLANK)

SECTION 2 BIDDING

2-1.01 SMALL BUSINESS AND NON–SMALL BUSINESS SUBCONTRACTOR PREFERENCES

General

The Department applies Small Business Preference or Non–Small Business Preference under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.

Contractors, subcontractors, suppliers, and service providers who qualify as small businesses are encouraged to apply for certification as a small business by submitting their application to the Department of General Services, Office of Small Business and DVBE Services.

Contract award is based on the total bid, not the reduced bid.

Small Business Preference

The Department allows a bidder certified as a small business by the Office of Small Business and DVBE Services, Department of General Services, a preference if:

1. The bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid
2. The low bidder did not request the preference or is not certified as a small business

The bidder's signature on the Request for Small Business Preference or Non–Small Business Preference form certifies that the bidder is certified as a small business at the time and day of bid or has submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on bid opening date.

The Department of General Services determines if a bidder was certified on bid opening date. The Department confirms the bidder's status as a small business before applying the small business preference.

The small business preference is a reduction for bid comparison in the total bid submitted by the small business contractor by the lesser of:

1. 5 percent of the verified total bid of the low bidder
2. $50,000

If after the application of the small business preference the Department determines that a certified small business bidder is the low bidder, the Department does not consider a request for non–small business preference.

Non–Small Business Subcontractor Preference

The Department allows a bidder not certified as a small business by the Office of Small Business and DVBE Services, Department of General Services, a preference if:

1. The bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid.
2. The Certified Small Business Listing for the Non–Small Business Preference form shows that you are subcontracting at least 25 percent to certified small businesses. You may submit this information with your bid. If you do not, submit it so that it is received by the Office Engineer no later than 4:00 p.m. on the 2nd business day after bid opening.

Each listed subcontractor and supplier must be certified as a small business at the time and day of bid or must have submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on bid opening date.

The non–small business subcontractor preference is a reduction for bid comparison in the total bid submitted by the non–small business contractor requesting the preference by the lesser of:

1. 5 percent of the verified total bid of the low bidder
2. $50,000

2-1.02 DISABLED VETERAN BUSINESS ENTERPRISES

General

Take necessary and reasonable steps to ensure that DVBEs have opportunity to participate in the contract.

Comply with Mil & Vet Code § 999 et seq.

The Department encourages bidders to obtain DVBE participation in order to ensure the Department achieves its State-mandated overall DVBE goal.

If you obtain DVBE participation:

1. Complete and submit the Certified DVBE Summary form. List all DVBE participation on this form.
2. List each 1st tier DVBE subcontractor on the Subcontractor List form regardless of percentage of the total bid.

DVBE Incentive

The Department grants a DVBE incentive to each bidder who achieves a DVBE participation of 1 percent or greater (Mil & Vet Code 999.5 and Code of Regs § 1896.98 et seq).

To receive this incentive, submit the Certified DVBE Summary form. If you do not submit this form with your bid and you are the low bidder or the 2nd or 3rd low bidder, submit it so that it is received by the Office Engineer no later than 4:00 p.m. on the 4th business day after bid opening. If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Summary form. Other bidders may be required to submit this form if bid ranking changes.

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 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, of the verified total bid of the low bidder
2. 5 percent of the verified total bid of the low bidder
3. $250,000

The Department applies DVBE incentive and determines if bid ranking changes.

A non-small business bidder cannot displace a small business bidder. However, a small business bidder with higher DVBE achievement can displace another small business bidder.

The Department proceeds with awarding the contract to the new low bidder and posts the new verified bid results at its Office Engineer Web site.

2-1.03 CALIFORNIA COMPANIES

Under Pub Cont Code § 6107, the Department gives preference to a "California company," as defined, for bid comparison purposes over a nonresident contractor from any state that gives or requires a preference to be given to contractors from that state on its public entity construction contracts.

Complete a California Company Preference form.

The California company reciprocal preference amount is equal to the preference amount applied by the state of the nonresident contractor with the lowest responsive bid unless the California company is eligible for a small business preference or a non–small business subcontractor preference; in which case the preference amount is the greater of the two, but not both.

If the low bidder is not a California company and a California company's bid with reciprocal preference is equal to or less than the lowest bid, the Department awards the contract to the California company on the basis of its total bid.

2-1.04 TIE BID RESOLUTION

If a small business bidder and a non–small business bidder request preferences and the reductions result in a tied bid, the Department awards the contract to the small business bidder.

If a DVBE small business bidder and a non-DVBE small business bidder request preferences and the reduction results in a tied bid, the Department awards the contract to the DVBE small business bidder.

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

2-1.05 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

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

SECTION 3 CONTRACT AWARD AND EXECUTION

3-1.01 SMALL BUSINESS PARTICIPATION REPORT

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

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

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

The 1st working day is the 55th day after contract approval.

Do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until the Engineer approves your submittal for:

1. Baseline Progress Schedule (Critical Path Method)
2. Storm Water Pollution Prevention Plan (SWPPP)
3. Notification of Dispute Review Board (DRB) nominee and disclosure statement

In addition to the above submittals, do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until you submit:

1. Notice of Materials To Be Used.
2. Contingency plan for reopening closures to public traffic.
3. Written statement from the vendor that the order for the sign panels has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
4. Written statement from the vendor that the order for electrical material has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
5. Written statement from the vendor that the order for structural steel has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start work at the job site before the 55th day after contract approval if:

1. You obtain required approval for each submittal before the 55th day
2. The Engineer authorizes it in writing

The Department grants a time extension if a delay is beyond your control and prevents you from starting work at the job site on the 1st working day.

The second through fourth paragraphs, inclusive, and the first sentence of the fifth paragraph of Section 8-1.06, "Time of Completion," of the Standard Specifications shall not apply. A working day is defined as any day, with no exceptions.

Complete the work within 1140 working days starting on the 55th day after contract approval and in accordance with the following designated portions of work as specified:

Designated Portion of Work 1: Complete all structural, electrical, mechanical, underground, and roadway work as shown on the plans per Stage 1 Phase 1 and Stage 1 Phase 2.

Bids in which the number of working days bid for completion of the Designated Portion of Work 1 exceed 300 days will be considered non-responsive and will be rejected.

The Designated Portion of Work 1 must be diligently prosecuted to completion before the expiration of the number of working days bid starting on the 55th day after contract approval.

Liquidated damages are $10,500 per day starting on the first day after exceeding the number of working days bid for completion of Designated Portion of Work 1.

Designated Portion of Work 2: Complete all work required to open the new eastbound and westbound Route 80 to traffic as shown on the plans per Stage 2, during the 72-hour full closure of Route 80 specified in "Maintaining Traffic" of these special provisions.

It is anticipated that the 72-hour full closure of Route 80 is to occur on Labor Day weekend of year 2013.

Designated Portion of Work 2 must be diligently prosecuted to completion before the expiration of the 72-hour full closure of Route 80.

The damage amount for each 10-minute interval, or fraction thereof past the time specified to reopen the closure is to be deducted by the Department from moneys due or that may become due the Contractor under the contract, in conformance with the provisions in "Closure Requirements and Conditions," of these special provisions.

Designated Portion of Work 3: Complete all structural, electrical, mechanical, underground, and roadway work required for the completion of the permanent bike path, roadway, structure, and Maintenance Road (MS1 and MS2 lines), including landscaping along the bike path, eastbound Route 80, and Maintenance Road (MS1 and MS 2 lines).

Designated Portion of Work 3 must be diligently prosecuted to completion before the expiration of 180 working days after completion of Designated Portion of Work 2.

Liquidated damages are $10,500 per day starting on the first day after exceeding 180 working days for completion of Designated Portion of Work 3.

Designated Portion of Work 4: Complete all remaining work, except plant establishment.

Designated Portion of Work 4 must start on the day after completion of Designated Portion of Work 2 and must be diligently prosecuted to completion before the expiration of 780 working days starting on the 55th day after contract approval.

Liquidated damages are $10,500 per day starting on the first day after exceeding thenumber of working days specified for completion of Designated Portion of Work 4.

Should two or more liquidated damages accrue concurrently, no more than $10,500 per day will be assessed.

Complete the plant establishment work within 360 working days starting on the 1st working day after completion of Designated Portion of Work 4.

The Department reduces liquidated damages to $950 per day if all the work, except plant establishment work, is complete and the 780 working days for completion of Designated Portions of Work 1, 2, 3, and 4 have expired.

The Department does not simultaneously assess liquidated damages for untimely completion of work and plant establishment work.

SECTION 5 GENERAL

5-1.01 EMISSIONS REDUCTION

Contract execution constitutes submittal of the following certification:

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

5-1.02 NON–SMALL BUSINESSES

Use each subcontractor as shown on the Certified Small Business Listing for the Non–Small Business Preference form unless you receive authorization for a substitution.

The requirement that small businesses be certified by the bid opening date does not apply to small business substitutions after contract award.

Maintain records of subcontracts made with certified small business subcontractors and records of materials purchased from certified small business suppliers. Include in the records:

1. Name and business address of each business
2. Total amount paid to each business

For the purpose of determining compliance with 2 CA Code of Regs § 1896 et seq.:

1. Provide the Department relevant information requested.
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of::

    2.1. Interviewing employees
    2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation

5-1.03 DISABLED VETERAN BUSINESS ENTERPRISES

Use each DVBE as shown on the Certified DVBE Summary form unless you receive authorization for a substitution.

The requirement that DVBEs be certified by the bid opening date does not apply to DVBE substitutions after contract award.

Maintain records of subcontracts made with certified DVBEs. Include in the records:

1. Name and business address of each business
2. Total amount paid to each business

For the purpose of determining compliance with Pub Cont Code § 10115 et seq.:

1. Upon contract completion, complete and submit Final Report - Utilization of Disabled Veteran Business Enterprises (DVBE) State Funded Projects Only form
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:

    2.1. Interviewing employees
    2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation

5-1.04 PARTNERING DISPUTE RESOLUTION

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

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

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

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

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

5-1.05 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

GENERAL

Summary

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

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

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

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

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

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

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

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

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

If the price index at the time of placement increases:

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

Submittals

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

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

ASPHALT QUANTITIES

General

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

Hot Mix Asphalt

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

$$Qh = HMATT \times [Xa / (100 + Xa)]$$

where:

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

Rubberized Hot Mix Asphalt

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

$$Qrh = RHMATT \times 0.80 \times [Xarb / (100 + Xarb)]$$

where:

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

Modified Asphalt Binder in Hot Mix Asphalt

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

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

where:

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

Hot Mix Asphalt Containing Reclaimed Asphalt Pavement (RAP)

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

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

where:

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

and

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

Tack Coat

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

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

Asphaltic Emulsion

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

Qe = AETT x (Xe / 100)

where:

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

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

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

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

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

Slurry Seal

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

Modified Asphalt Binder

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

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

where:

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

Other Materials

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

PAYMENT ADJUSTMENTS

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

The Engineer calculates each payment adjustment as follows:

PA = Qt x A

where:

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

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

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

For US Customary projects, use:

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

For metric projects, use:

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

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

Iu = California Statewide Crude Oil Price Index for the month in which the quantity of asphalt subject to adjustment was placed in the work.

Ib = California Statewide Crude Oil Price Index for the month in which the bid opening for the project occurred

T = Sales and use tax rate, expressed as a percent, currently in effect in the tax jurisdiction where the material is placed. If the tax rate information is not submitted timely, the statewide sales and use tax rate is used in the payment adjustment calculations until the tax rate information is submitted.

5-1.06 SURFACE MINING AND RECLAMATION ACT

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

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

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

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

5-1.07 ELECTRONIC SUBMISSION OF PAYROLL RECORDS

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

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

Electronic Mailboxes

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

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

Each electronic submission must:

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

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

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

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

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

5-1.08 WORKING DRAWINGS

Working drawings shall conform to the requirements in Section 5-1.02 "Plans and Working Drawings," of the Standard Specifications and these special provisions. Working drawings shall include supplements and calculations that are in addition to drawings.

Working drawings shall be submitted to the following location:

California Department of Transportation
Office of the Resident Engineer, Contract 04-0120M4
345 Burma Rd
Oakland, CA 94607

Working drawings shall conform to the following:

A. For initial review, 6 sets of the working drawings shall be submitted. After the Engineer has determined that a submittal is complete, 12 additional sets shall be submitted.
B. Drawings shall be 559 mm x 864 mm or 279 mm x 432 mm in size. Supplements and calculations shall be 216 mm x 280 mm in size.
C. For drawings, text size shall be nominally 2.8 mm high, minimum. For supplement and calculations, font size shall be 12, minimum.
D. Each working drawing sheet and each page of supplement or calculation, shall include the jobsite name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, bridge number and contract number.
E. Text and details shall be legible and suitable for photocopying and reduction.
F. In addition to the paper copies of the working drawings, electronic files shall be submitted. Electronic files shall be portable document format (PDF) and shall be submitted on compact disk (CD) media. Each plan sheet shall be a separate PDF file on the CD. The electronic copy of the calculations and supplement shall be made into separate PDF files so that no more than 50 pages are included in a single file on the CD. The CD shall contain an index consisting of the file names and a description of the corresponding file contents. The files shall be listed in the sequence of: 1) index, 2) drawings, 3) supplement, and 4) calculations. If more than one CD is used for a given working drawing submittal, the index shall be included on each CD.
G. After review and approval of the working drawings, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Engineer for final approval. These sets will be the only sets stamped "Approved" and will be distributed for use during construction.

H. At the completion of the contract, one set of reduced prints on 75-g/m2 (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all approved working drawings, including all corrections and revisions shall be furnished to the Engineer. Reduced prints that are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index. In addition to the paper copies electronic files in PDF format on CD media shall be submitted to the Engineer.

When design calculations are required by the Standard Specifications or these special provisions, they shall be prepared and sealed by an engineer who is registered as a Civil Engineer in the State of California. Working drawings developed from these calculations should be similarly sealed by the same engineer. When independently checked calculations are required, these calculations shall be sealed and signed by an engineer who is registered as a Civil Engineer in the State of California and who did not seal and sign the drawings.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work, but in no case shall the time be less than the review time as specified for the type of working drawings as required elsewhere in these special provisions.

The Engineer will review a working drawing submittal for completeness. Within 7 days of the receipt of the submittal by the Engineer, the Engineer will notify the Contractor in writing if the submittal is determined to be incomplete and the submittal will be returned. If the submittal is determined to be complete, 30 working days from the day of receipt shall be allowed for approval or return for correction, unless specified otherwise in these special provisions. The review time for a set of working drawings will be considered as starting when the Engineer has received a complete set of working drawings and all supporting data.

The review time on a set of returned drawings will be suspended on the date the drawings are date stamped by the Engineer for return. After a revised set of drawings have been received by the Engineer, the new review time for that set of revised drawings will be the original review time, less the time already spent under review before rejection. The revised set shall cover the same work as was originally submitted. In no case shall the review time allotted the Engineer upon receipt of a resubmittal be less than 14 days.

In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, the Contractor's controlling operation on the critical path is delayed 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 the provisions in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and in "Progress Schedule (Critical Path Method)," of these special provisions. Such a delay will be considered a right of way delay and compensation will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5–1.09 VALUE ANALYSIS

Comply with the provisions in Section 4-1.035, "Value Engineering," of the Standard Specification, and these special provisions.

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop with no other corridor construction contractors in attendance, in addition to the requirement of a "Corridor Value Analysis" workshop for San Francisco Oakland Bay Bridge (SFOBB) , as specified in "Corridor Value Analysis," of these specifications.

5–1.10 CORRIDOR VALUE ANALYSIS

A San Francisco Oakland Bay Bridge (SFOBB) corridor value analysis workshop will be conducted by the Department.

The Contractor must attend a "SFOBB Corridor Value Analysis" workshop on a semi-annual basis until contract acceptance.

It is anticipated that one or more other contractors from various contracts, which are specified in "Cooperation," of these special provisions will also participate in the workshop.

The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications of any and all corridor projects that will reduce either the total corridor cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of this contract or any other corridor construction contract 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. The workshop shall focus on potential enhancing opportunities which would result in any and all corridor construction contractors meeting their respective contractual milestones, early completion of any and all corridor construction contract's designated portions of work and project completion dates, and mitigating delays to any and all corridor construction contracts.

The costs involved in providing the "Value Analysis" facilitator and workshop site for the semi-annual "SFOBB Corridor Value Analysis" workshop will be borne by the State in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, except no markups will be allowed.

All other costs including, but not limited to, wages and travel expenses, associated with the semi-annual "SFOBB Corridor Value Analysis" workshop will be borne separately by the party incurring the costs, and no additional compensation will be allowed therefor.

5-1.11 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	30
Materials	10
Equipment Rental	10

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

The above markups, together with payments made for time-related overhead 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.

5-1.12 PAYMENTS

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

1. Control and Neutral Conductor
2. Irrigation Controllers
3. Irrigation Controller Enclosure Cabinet
4. Pipe
5. Sprinklers
6. Valves
7. Air Line (Bridge)
8. Sewer Line (Bridge)
9. Sewer Line Casing Pipe (Bridge)
10. Formed Panel Sign (Overhead)
11. Sign Structure (Truss)
12. Culvert Pipes (Plastic Pipes)
13. Miscellaneous Iron and Steel
14. Chain Link Fence
15. Welded Wire Steel Railing
16. Crash Cushion Module
17. Pavement Markers
18. Camera Assemblies
19. High Mast Pole
20. Fiber Optic
21. Fiber Optic Splice Closure
22. Prestressing Steel for cast-in-place members, sealed packages only
23. Prestressing Ducts and Anchorages
24. Precast Concrete members
25. Bar Reinforcing Steel
26 Bar Reinforcing Steel (Epoxy Coated)
27. Headed Bar Reinforcement
28. Bikepath Expansion Joint
29. PTFE Spherical Bearing
30. Bridge Deck Drainage System
31. Miscellaneous Metal
32. Bikepath Railing
33. Welded Steel Pipe Casing
34. Bike Path Grating and Grating Attachment Assemblies
35. Steel Piling
36. Precast Prestressed Pile

Plate steel for fabrication of structural steel and fabricated elements for structural steel fabricated and stored within the United States will be eligible for partial payment if the Contractor furnishes evidence satisfactory to the Engineer that its storage is subject to or under the control of the Department and that it has been designated or fabricated specifically for this project and is of such character that is not adaptable to any other use.

5-1.13 SUPPLEMENTAL PROJECT INFORMATION

Supplemental project information attached to the project plans are:

Log of Test Borings

Supplemental project information included in the Information Handout and Information available for Inspection are:

INFORMATION HANDOUT

Structure Information Handout

Data and information shown in the Materials Information are:

1. Project specific design criteria "Design Criteria, San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Self Anchored Suspension Bridge, dated April, 2002 by T. Y. Lin International/Moffatt & Nichol Engineers, a Joint Venture"
2. Notification of California Department of Transportation Qualification Requirement for Ultrasonic Testing Personnel
3. The recommendations of CEB-FIP Model Code 1978 for Concrete Structures (Comité Euro-international du Béton, and the Fédération Internationale de la Précontrainte)
4. NCHRP Report 402

Geotechnical Information Handout

Data and information shown in the Materials Information are:

1. Pile Installation Demonstration Project (PIDP) Geotechnical Report: Main Text & Appendices
2. Ground Motion Report: Main Text and Appendices
3. Phase-I Subcontractor Reports:
   Volume-1 through Volume-4
4. Phase-II Subcontractor Reports:
   Volume-1 through Volume-3
5. Final Geotechnical Foundation Report for Oakland Shore Approach Structures
6. Revised Final Oakland Shore Approach Geotechnical Site Characterization Report
7. Foundation Report for Bent 19AR by Fugro-Earth Mechanics a Joint Venture
8. Foundation Report for EBMUD Overcrossing
9. Foundation Recommendations for Changeable Message and Overhead Signs
10. Foundation Report for Bikeway Lighting

District Information Handout

1. Permits, Licenses, Letters and Agreements, including:

   1.1. California Regional Water Quality Control Board Order R2-2002-0011 (Issued January 23, 2002)
   California Regional Water Quality Control Board Order 01-120 (Issued October 17, 2001)
   1.2. San Francisco Bay Conservation and Development Commission (BCDC) Permit No. 8-01 (Issued on November 20, 2001), and Amendments
   1.3. U.S. Army Corp of Engineers (ACOE) Permit No. 023013-0S (Issued December 4, 2001), and letters of modification
   1.4. U.S. Coast Guard (USCG) New Bridge Permit
   1.5. California Department of Fish and Game (CDFG) Incidental Take Permit No. 2081-2001-021-03 (Issued November 19, 2001), and Amendments
   1.6. U.S. Fish and Wildlife Service (USFWS) Biological Opinions
   1.7. National Marine Fisheries Service (NMFS) Biological Opinion, and Incidental Take Statement, Issued October 30, 2001, and Supplemental Biological Opinions and Conference Opinions
   1.8. National Marine Fisheries Service (NMFS) Incidental Harassment Authorization

   For the latest version of permits, the Bidder and Contractor shall visit the website:

   www.biomitigation.org

2. Archaeological Survey Reports
3. SFOBB East Span Survey Info
4. Ground Penetration Report No. 6488-01, GEO Vision, November 2006.
5. Confidentiality Agreement Form
6. Stormwater Information Handout
7. Non-Stormwater Information Package

INFORMATION AVAILABLE FOR INSPECTION

Supplemental project information available for inspection, upon written request, at the office of the Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty_senior_district04@dot.ca.gov, telephone (510) 286-5209 are:

1. Final Environmental Impact Statement/California Environmental Quality Act (CEQA) Statutory Exemption and Record of Decision
2. Order No. R2-2006-0075, NPDES General Permit No. CAG912002 from SFRWQCB
3. Caltrans letters to the Dredged Material Management Office with draft disposal plan
4. As-built plans of the existing San Francisco-Oakland Bay Bridge
5. Soil samples and rock cores
6. Referee samples of Federal Color No. 26099, "Charcoal Gray" and Federal Color No. 26440, "Light Gray", regarding polyester concrete overlay for the bike path.
7. Referee samples of Federal Standard colors No. 27925 and No. 27880
8. Cross sections are available in paper copy
9. Site Investigation Report

    9.1. San Francisco-Oakland Bay Bridge Gateway Project, Oakland, CA, Geocon, May 1999
    9.2. The Oakland Mole San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Alameda County, CA, Geocon, October 2001
    9.3. Task Order Number 04-012041-UB, Contract Number 43A0078, Oakland Mole, Alameda County, CA, PSI, June 25, 2002
    9.4. SFOBB Oakland Touchdown East Span Seismic Safety Project, Oakland, CA, Geocon, September 2005
    9.5. SFOBB Oakland Touchdown East Span Seismic Safety Project, Oakland, CA, Geocon, June 2006
    9.6. San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Oakland Touchdown 2, Oakland, CA, Geocon, February 2010

10. Bridge as-built plans: existing San Francisco-Oakland Bay Bridge, and Oakland Approach Structures – Phase 1 (04-0120L4).

As-built plans of the existing San Francisco-Oakland Bay Bridge, and Oakland Approach Structures – Phase 1 (04-0120L4) are available for inspection, upon written request, at the Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty_senior_district04@dot.ca.gov, telephone number (510) 286-5209, and fax number (510) 622-1805. Requests shall be made on company letterhead and shall include the information requested, the purpose for the information (include contract or permit numbers), and contact information.
When a request to review, inspect, or copy as built plans is approved by the Duty Senior, the Contractor shall provide photo identification and fill and sign a "Confidentiality Agreement Form" with the Department.

The "Confidentiality Agreement Form" is available at the following Internet address:

http://www.dot.ca.gov/hq/esc/confidentiality_agreement.pdf

When the Contractor's work is finished, the Contractor shall return all obtained as-built plans back to the office of Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, California 94612, fax number: (510) 622-1805, email: duty_senior_district04@dot.ca.gov, telephone (510) 286-5209.

5-1.14 INTEGRATED SHOP DRAWINGS

This work shall consist of developing three-dimensional integrated shop drawings (ISD's) for the following locations, in accordance with the details shown on the plans and the requirements of this section.

A. Pier caps at Pier E20R, Pier E21R and Pier E22R
B. Utility Penetrations at Pier cap and Hinge Diaphragms
C. Hinge FE
D. Abutment End Diaphragm
E. Bikepath Beams Interface with the superstructure at Girder, Pier cap, Hinge FE and Abutment End Diaphragms
F. Light Pole Foundations

Difficult construction is anticipated at locations that are highly congested with reinforcing steel, post-tensioning strand tendons, anchor bolts, and other concrete embedded items as shown on the plans. It is anticipated that various dimensional conflicts may be encountered between the planned locations of these embedded items.

ISD's shall conform to Section "Working Drawings" of these special provisions. ISD's shall be composite placing drawings to scale and in sufficient detail to show the relative positions of all items that are to be embedded in the concrete and their embedment depth as necessary to demonstrate compatibility of items within the concrete. ISD's shall be prepared under the supervision of an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall field measure locations of reinforcement at existing columns and seismic joint blockouts and utilize these measurements in the preparation of related bent cap ISD's.

Prior to commencing work on the ISD, the Contractor (including any sub-consultants hired to work on the ISD) shall attend a meeting with the Engineer to discuss the ISD work. ISD status meetings shall be held regularly, or as required by the Engineer, to discuss the progress of the ISD work.

The Contractor shall utilize commercially available software that checks for interference in three dimensions to identify any conflicts in the planned positions of embedded items in the ISD's. The software shall be compatible with the computer-aided drafting (CAD) software used to develop the ISD's. Prior to acquiring the software, the Contractor shall submit to the Engineer the product name and application features of the software for review and approval. Bar reinforcement shall be shown with deformed diameters. The Contractor shall develop CAD files using different layers for each type of embedded item such that the sequence of construction of the member or area being detailed can be shown.

Embedded items that are to be shown on the ISD's shall include but are not limited to, the following:

A. Prestressing ducts and anchorages
B. Bar reinforcing steel and splices including lap, welded, and mechanical splices
C. Anchor bolts
D. Anchor bolt plates
E. Grout vents
F. Seismic expansion joints
G. Drainage pipe
H. Utility conduits and openings
I. Inserts, bolt sleeves and studs
J. Headed bars
K. Epoxy coated bars
L. Column pipe keys
M. Other items, as shown on the plans or added by the Contractor

The Contractor shall use three-dimensional ISD's to identify and propose resolution of all conflicts and interference between the planned positions of embedded items and to satisfy the concrete cover shown on the plans.

If a conflict is identified, the Contractor shall document the conflict and propose changes to the embedded items in the ISD's to resolve the conflict. Proposed changes to the embedded items shall be made by a licensed engineer practicing Civil Engineering with extensive previous experience developing ISD.

The Contractor's proposed changes in the ISD's shall comply with the following sequence of item adjustments:

1. Non structural embedded items
2. Reinforcing steel including headed bar reinforcement and epoxy coated reinforcement
3. Transverse prestressing ducts
4. Bearing anchor bolts

The Contractor is advised that the Engineer may not permit modifications to the location of items.

For conflicts involving bar reinforcing steel that cannot be resolved by adjusting nonstructural embedded items, the Contractor shall apply the following sequence of adjustments in order as necessary and as approved by the Engineer:

A. Adjust reinforcement spacing
B. Bundle bars
C. Relocate splices
D. Change reinforcement size and number. Reduction of the total reinforcement area will not be permitted unless otherwise permitted by the Engineer
E. Change reinforcement shape
F. Move embedded inserts
G. Cut/trim reinforcement
H. Combination of all the above

The ISD's to be submitted to the Engineer shall include the following:

A. Baseline/Conflict Identification ISD: Three sets of the ISD's corresponding to the details as shown on the plans without any modifications. These ISD's shall indicate all conflicts including locations of the conflicts and items involved in the conflicts.
B. Conflict List: Three complete lists of conflicts with descriptions and the Contractor's proposed modifications for each conflict.
C. Proposed Modifications ISD: Three sets of the ISD's corresponding to the details as shown on the plans with incorporation of the Contractor's proposed modifications. These ISD's shall indicate that all previous identified conflicts have been resolved and concrete cover requirements as shown on the plans are met.
D. ISD submittal shall be in two-dimensional format utilizing the three-dimensional layouts as input. ISD's shall be 260 mm x 432 mm in size and shall use colored ink to differentiate each type of embedded items.
E. Three copies of the ISD's in electronic form on compact discs or tape for use by the Engineer.

An ISD submittal that complies with all of the above requirements, in the opinion of the Engineer, will be defined as a complete ISD submittal. Isometric drawings, if submitted, shall in no way relieve the Contractor from any other working drawing submittal required by these special provisions or the Standard Specifications.

CAD files of the contract drawings will not be made available to the Contractor.

After an ISD submittal is received by the Engineer, the Contractor shall allow the Engineer 7 days to review the ISD submittal for completeness. If determined to be complete, the Engineer shall have 28 days from the day of receipt to review and approve the ISD submittal. For proposed modifications that are not approved by the Engineer, the Engineer will propose alternative modifications to the Contractor. Modifications that result in changes to the plans or specifications, as determined by the Engineer, will be made in accordance with Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall submit revised ISD's incorporating the Engineer's alternative modifications as specified in this section. For each revised ISD submitted by the Contractor, the Contractor shall allow the Engineer an additional 2 weeks for review and approval. If more than one ISD is submitted at one time, the time to be allowed for the review of the ISD shall not be less than the review time specified above plus 14 days for each ISD submittal still under review and the Contractor shall designate the sequence in which the submittals are to be reviewed.

Construction of the items at locations listed above and adjacent areas shall not begin until the Engineer reviews and approves the complete ISD submittal with all conflicts resolved.

No extension of time will be permitted for the Contractor's failure to identify all conflicts or to complete the ISD's as required by these special provisions.

Full compensation for preparing ISD's, including ISD status meetings, computer software as described in this section, and all revisions necessary due to conflict resolution measures described in this section, 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.

5-1.15 COST REDUCTION INCENTIVE PROPOSALS

Cost Reduction Incentive Proposals (CRIP) shall conform to the provisions in Section 4-1.035B, "Value Engineering Change Proposals," of the Standard Specifications and these special provisions.

Attention is directed to "Description of Bridge Work" of these special provisions for the description of basic design of the bridge.

The Contractor shall reimburse the Department's costs for investigating and reviewing a CRIP including the preliminary concept of a CRIP regardless whether it is approved or rejected. The Contractor shall indicate acceptance thereof in writing, and that acceptance shall constitute full authority for the Department to deduct amounts payable to the Department from any moneys due or that may become due to the Contractor under the contract.

No proposals will be permitted in the following:

A. Structure Type and Cross-Sections
B. Number and Location of Hinges
C. Span Lengths
D. Slope of Exterior Girder
E. Box Girder Exterior Dimensions
F. Pier Cross-Sections
G. Pile Dimensions and Layout
H. Footing Type and Dimensions
I. Specified Pile Tip Elevations
J. Minimum Hammer Energy
K. Welding Requirements and Procedures
L. Bikepath Structure

The Contractor shall submit the preliminary concept of proposed CRIP in writing to the Engineer for approval prior to proceeding with the complete CRIP. After submitting the preliminary concept of proposed CRIP, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine whether the cost reduction proposal will be considered by the Department. Items of discussion will include permit issues, impact on other projects, impact on the project schedule, traffic considerations, safety and health issues, design criteria, and review times required by the Department and other agencies. Determination by the Engineer that a cost reduction proposal will not be considered further will be deemed rejection of the proposal. The Contractor shall allow 15 working days after the meeting for the Engineer to review the conceptual submittal. Acceptance of a conceptual submittal in no way constitutes approval nor guarantees future approval of the Contractor's CRIP.

If the proposed CRIP affects the seismic performance of the structure, as determined by the Engineer, the Contractor shall present the CRIP proposal to the Seismic Safety Peer Review Panel (SSPRP). It is anticipated that this presentation to the SSPRP will require a 2-month notice and 6 meetings (occurring once a month). The meeting location(s) will be in California, and the meeting location and schedule will be determined by the SSPRP. The Engineer will not further consider said CRIP unless it is approved by the SSPRP. The Contractor's cost of preparing the SSPRP presentation and attending the SSPRP meetings and the Department's costs of investigating said proposal, presentation, meeting attendance, and compensation to the SSPRP, including any portion thereof paid by the Contractor, shall be excluded from consideration in determining the estimated new savings in construction costs.

No extension of time and no delay will be granted for the development, submittal, investigation, and review of CRIPs.

5-1.16 TIDAL CONDITIONS AND ELEVATION DATUM

Attention is directed to Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Tidal conditions may present significant problems in constructing the work as depicted in the contract plans. Tidal fluctuations may be severe and different from those shown in published tidal and current data due to differences in datum, winter runoff and other causes. Strong currents exist over portions of the project site. Limited time periods of slack water may restrict diving and other underwater activities.

The Contractor is responsible for being knowledgeable of such tidal difficulties, and no payment will be made by the State for any costs incurred by the Contractor in connection with the variations in actual tidal or current conditions during the course of this contract. Any reference to Mean Higher High and Mean Lower Low tides shall be understood to be an estimate used for permit purposes, actual mean tide data shall be determined by the Contractor.

All vertical control data are based on the National Geodetic Vertical Datum NGVD of 1929.

5-1.17 BIRD PROTECTION

GENERAL

This work includes protecting migratory and nongame birds, their occupied nests, and their eggs.

Nesting or attempted nesting by migratory and nongame birds is anticipated to occur but is not limited to February 1st through August 31st.

The Contractor must coordinate performance of pre-construction surveys with the Engineer a minimum of 10 working days and a maximum of 15 working days prior to any vegetation clearing or bridge removal.

QUALITY ASSURANCE

Regulatory requirements

The Federal Migratory Bird Treaty Act (16 USC §703-711.), 50 CFR 10, and Fish & Game Code §3503, §3513, and §3800, protect migratory and nongame birds, their occupied nests, and their eggs.

The Federal Endangered Species Act of 1973 (16 USC §1531,§1543) and California Endangered Species Act (Fish & Game Code §2050-§2115.5) prohibit the take of listed species and protect occupied and unoccupied nests of threatened and endangered bird species.

The Bald Eagle Protection Act (16 USC §668) prohibits the destruction of bald and golden eagles occupied and unoccupied nests.

Permits are included in the Project Information handout.

CONSTRUCTION

When migratory or nongame bird nests are discovered which may be adversely affected by construction activity, or when a bird is found injured or killed as a result of construction activity, immediately stop work within 30 meters of the nest or bird and notify the Engineer. Work must not resume until the Engineer provides written notification that work may resume at that location.

When ordered by the Engineer, use exclusion devices, nesting prevention measures or remove and dispose of partially constructed and unoccupied nests of migratory or nongame birds on a regular basis to prevent their occupation.

Nest removal activities must not result in depositing into or allowing materials to enter waters of this state.

MEASUREMENT AND PAYMENT

Exclusion devices, nesting prevention measures and nest removal that are ordered by the Engineer will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

A delay to the controlling operation due to migratory or nongame birds or their nests will be considered a temporary suspension of work under Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Adjustments will be made for delays that the Engineer determines are not due to the Contractor's failure to perform the provision of the contract in the same manner as for suspensions due to unsuitable weather in Section 8-1.05.

5-1.18 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

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

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

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

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

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

The San Francisco Bay RWQCB has issued a permit which governs storm water and non-storm water discharges resulting from construction activities in the project area. The RWQCB permit is entitled Waste Discharge Requirements, Order No. R2-2002-0011. A copy of the RWQCB permit is available as information handout in "Supplemental Project Information," of these special provisions.

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

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

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

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

5-1.19 ENVIRONMENTALLY SENSITIVE AREA

ESAs exist on this project.

Take the management measures shown in the following table for the corresponding ESA shown. Any access to an ESA other than that shown is prohibited.

ESA Management

Identification	Location	Management measures
ESA 1: Eelgrass Beds	North of westbound Route 80 near Toll Plaza metering lights.	1. ESA 1 2. No access is allowed into ESA 1 boundary as shown on the plan.
ESA 2: Non-Tidal Wetland	North of westbound Route 80 near the Radio Towers	1. Before start of work, protect ESA 2 by installing temporary fence (Type ESA). For ESA 2 fence limits see environmentally sensitive areas construction details sheet. 2. No access is allowed.
ESA 3: Historical Key Building	South of eastbound Route 80, between PG&E Substation and Historical Mole Substation.	1. Before start of work, install temporary fence (Type ESA). 2. Where applicable, temporary fence (Type ESA) can be attached to existing chain link fence. 3. No access is allowed.
ESA 4: Historical Mole Substation	South of eastbound Route 80, immediately east of Historical Key Building .	1. Before start of work, install temporary fence (Type ESA). 2. Where applicable, temporary fence (Type ESA) can be attached to existing chain link fence. 3. No access is allowed.
ESA 5: Southern Shoreline	South of eastbound Route 80, South of the Bus Turnaround, and South of the west end of Burma Road.	1. Before start of work, install temporary fence (Type ESA) as shown on the plans. 2. No access is allowed.
ESA 6: Wetland	South of eastbound Route 80, and south of the Bus Turnaround.	1. Before start of work, install temporary fence (Type ESA) as shown on the plans.

5-1.20 PRESERVE HISTORICAL BUILDINGS

Existing listed facilities as shown on the plans are historical buildings, and must be preserved in compliance with the provisions in Section 5-1.18, "Property and Facility Preservation," of the Standard Specifications, and these special provisions.

1. Historical Key Building (ESA 3)
2. Historical Mole Substation (ESA 4)

Attention is directed to "Photo Survey of Existing Facilities," and "Vibration Monitoring," of the special provisions, regarding historical buildings.

The Contractor must take measures to protect the two buildings from damage caused by the Contractor's operations. The Contractor must submit a building protection plan for the Engineer's review at least 30 days prior to the start of adjacent construction or overhead construction. The Contractor must also notify the Engineer at least 48 hours prior to the start of adjacent or overhead construction.

The Contractor must bear full liability for any damage to the historical buildings caused by the Contractor's operations.

Should any damage to the historical buildings occur, the Contractor must notify the Engineer within 24 hours. The Engineer may order the suspension of construction operations until the Contractor takes all necessary measures to prevent further damage to the building, and until an approved repair is completed. The Contractor must submit a repair plan to the Engineer for approval prior to the start of such work. The Engineer has 90 days to review the plan. All repairs must comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties, and must be undertaken by a licensed preservation architect who meets the Secretary of the Interior's Professional Qualification Standards for Historic Architecture.

The Secretary of the Interior's Standards for Treatment of Historic Properties, and the Secretary of the Interior's Professional Qualification Standards are available at the following websites:

http://www2.cr.nps.gov/tps/standguide/index.htm)
(http://www.cr.nps.gov/local-law/arch_stnds_9.htm)

The Contractor must bear full liability for any damage to the historical buildings caused by the Contractor's operations.

In the event of failure to preserve the historical buildings, the Department may withhold an amount not less than $2,000,000 from payments due or that may become due the Contractor under the contract, until an approved repair or reconstruction is complete.

5-1.21 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

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

5-1.22 AREAS FOR CONTRACTOR'S USE

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

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

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

Toll plaza parking lots shall not be used for the Contractor's employees private vehicles and the Contractor's equipment and vehicles.

The Contractor must not store materials nor operate equipment or vehicles within 3.8m from centerline of the EBMUD outfall pipe.

The Contractor shall remove the equipment, materials, and rubbish from the work areas and other State-owned property which the Contractor occupies and 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 storage of plant, equipment, and materials, or for other purposes if sufficient area is not available to the Contractor within the contract limits.

5-1.23 UTILITIES

The Contractor shall make arrangements to obtain electrical power, water or compressed air or other utilities required for the Contractor's operations and shall make and maintain the necessary service connections at the Contractor's own expense.

5-1.24 SANITARY PROVISIONS

State sanitary facilities will not be available for use by the Contractor's employees.

5-1.25 BRIDGE TOLLS

Toll-free passage on the San Francisco-Oakland Bay Bridge will be granted only for cars, trucks and special construction equipment which are clearly marked on the exterior with the Contractor's identification and which are being operated by the Contractor exclusively for the project, and which are used for the purpose of transporting materials and workers directly to and from the project site.

The Contractor shall make application to the Engineer in advance for toll-free passage. The Contractor will be held accountable for the proper use of passes issued, and upon completion of the work, shall return unused passes to the Engineer.

Attention is directed to Section 23302, "Evasion of Toll," of the Vehicle Code.

5-1.26 ACCESS TO PROJECT SITE

Prospective bidders may make arrangements to visit the project site by contacting the Duty Senior, District 04 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty_senior_district04@dot.ca.gov, telephone number (510) 286-5209.

5-1.27 PERMITS, LICENSES, AGREEMENTS, AND CERTIFICATIONS

Attention is directed to Section 7-1.04, "Permits and Licenses," of the Standard Specifications and these special provisions.

The Department has obtained the permits, and licenses from the following agencies for this project:

1. California Regional Water Quality Control Board Order R2-2002-0011 (Issued January 23, 2002)
   California Regional Water Quality Control Board Order 01-120 (Issued October 17, 2001)
2. San Francisco Bay Conservation and Development Commission (BCDC) Permit No. 8-01 (Issued on November 20, 2001), and all Amendments to the permits
3. U.S. Army Corp of Engineers (ACOE) Permit No. 023013-0S (Issued December 4, 2001), and all letters of modification
4. U.S. Coast Guard (USCG) New Bridge Permit (Issued December 11, 2001)
5. California Department of Fish and Game (CDFG) Incidental Take Permit No. 2081-2001-021-03 (Issued November 19, 2001)
   California Department of Fish and Game (CDFG) Minor Amendment No. 1 Incidental Take Permit No. 2081-2001-021-03 (Issued October 14, 2009)
6. U.S. Fish and Wildlife Service (USFWS) Biological Opinion (Issued October 29, 2001)
7. National Marine Fisheries Service (NMFS) Biological Opinion (Issued October 30, 2001)
   National Marine Fisheries Service (NMFS) Supplemental Biological Opinion and Conference Opinion (Issued April 10, 2009)
   National Marine Fisheries Service (NMFS) Supplemental Biological Opinion and Conference Opinion (Issued August 21, 2009)
8. National Marine Fisheries Service (NMFS) Incidental Harassment Authorization (Issued August 12, 2009)

For the latest version of permits, the Bidder and Contractor shall visit the website:

www.biomitigation.org

Copies of these permits, and licenses have been made on Compact Disks as part of the information handout that is available to the Contractor, as specified in "Supplemental Project Information," of these special provisions, or can be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490 or may be seenand are available at the Duty Senior, District 04 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty_senior_district04@dot.ca.gov, telephone number (510) 286-5209.

Full compensation for conforming to the requirements in these permits, and licenses shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.28 RESPONSIBILITY TO OTHERS

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public or damage to property, and shall indemnify and save harmless T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture and its consultants and subconsultants, in the same manner and to the same extent conforming to the provisions in Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications for the protection of the State of California and all officers and employees thereof connected with the work. The Contractor's commercial general liability (CGL) insurance policies shall name T.Y. Lin International / Moffatt & Nichol Engineers, a Joint Venture, their respective affiliates, parent or affiliated corporations, directors, officers, partners, representatives, employees, consultants, subconsultants and agents, as additional Insureds in the same manner and to the same extent that the State of California is named as an additional insured conforming to the provisions of Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications and these special provisions.

Certificate of Insurance shall provide ten (10) days advance written notice of cancellation or renewal. In addition to any other requirements to furnish copies of insurance documents in these specifications, the contractor shall provide certificates of liability insurance and endorsements to the following address:

T.Y. Lin International / Moffatt & Nichol Engineers, A Joint Venture
c/o Dealey, Renton & Associates
P.O. Box 12675
Oakland,CA 94604-2675
Attn: Julie Nelson

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
57or 60	18

[1]Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.
[2]Bar 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 Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	SIZE TO BE SUBSTITUTED Penny-weight
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

SUBSTITUTION TABLE FOR STEEL PIPE CASING FOR MICROPILES (API 5CT- GRADE N80)

NOMINAL OUTSIDE DIAMETER		WALL THICKNESS	
METRIC DIAMETERS SHOWN ON THE PLANS mm	DIAMETER TO BE SUBSTITUTED inch	METRIC THICKNESS SHOWN ON THE PLANS mm	THICKNESS TO BE SUBSTITUTED inch
245	9-1/2	13	0.50

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 C80FH
3. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm) and ARC Round Shoulder (100 mm x 100 mm)
4. 3M Series 290 (89 mm x 100 mm)
5. 3M Series 290 PSA
6. Glowlite, Inc Model 988AR (100 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) and PP (Polypropylene)
4. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
5. Interstate Sales, "Diamond Back" (Polypropylene)
6. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
7. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
8. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

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 Hot mix asphalt surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"
   (Black Tape: for use only on Hot mix asphalt surfaces)
10. Brite-Line "BTR" Black Removable Tape
    (Black Tape: for use only on Hot mix asphalt surfaces)
11. Trelleborg Industries, RB-140
    (Black Tape: for use only on Hot mix asphalt surfaces)

Preformed Thermoplastic (Heated in place)

1. 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 and Dura-Post, Model SHL36SMA
10. Three D Traffic Works "Boomerang" 5200 Series

Lane Separation System

1. Filtrona Extrusion, "Flexi-Guide (FG) 300 Curb System"
2. Qwick Kurb, "Klemmfix Guide System"
3. Dura-Curb System
4. Tuff Curb

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
6. Work Area Protection Corp. C-42

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
7. Avery Dennison, T-9511 Fluorescent Yellow

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 and Permanent Signs up to 1400 mm.

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:

1. Ten meter roadway light poles and fixtures, including base plates, light fixtures, and pole mounted marker lights.
2. Bike path landing light poles and fixtures, including base plates, light fixtures, and pole mounted marker lights.
3. Model 170 controller assembly , and completely wired controller cabinet.
4. Call boxes.
5. Model 500 changeable message sign.
6. Strong motion detection system.
7. Modular joint seal assembly.
8. Seismic Joint (Abutment E23R)

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at Caltrans Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, telephone number (415) 330-6509.

Model 500 changeable message sign, wiring harness, and controller assembly, including the controller unit and completely wired cabinet, will be furnished to the Contractor at Caltrans Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, telephone number (415) 330-6509.

Ten meter roadway and bikepath landing light poles and fixtures will be furnished to the Contractor at a location within 16 km of the project limits.

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 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.

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.

Cementitious material to be used in portland cement concrete shall be a combination of Type II portland cement modified as per Section 90-2.01A, "Cement," of the Standard Specifications and supplementary cementitious materials.

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

Permanent structures with portland cement concrete in contact with soil or rock, including piles, footings, sign foundations, abutments, return walls, wing walls, cast-in-drilled-hole pile foundations for traffic signal and high mast lighting assemblies, are 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 in Section 90-2, "Materials," of the Standard Specifications, and shall be a combination of either Type II or Type V portland cement and supplementary cementitious material.

Concrete in a corrosive environment shall contain not less than 400 kg of cementitious material per cubic meter.

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, is not permitted for concrete in a corrosive environment.

For concrete in a corrosive environment, the cementitious material shall be comprised of one of the following:

A. 25 percent by mass of either fly ash or natural pozzolan with a CaO content of up to 10 percent, and 75 percent by mass of portland cement
B. 20 percent by mass of either fly ash or natural pozzolan with a CaO content of up to 10 percent, 5 percent by mass of silica fume, and 75 percent by mass of portland cement
C. 12 percent by mass of either silica fume, metakaolin, or UFFA; and 88 percent by mass of portland cement
D. 50 percent by mass of ground granulated blast furnace slag, and 50 percent by mass of portland cement
E. Any combination of the above supplementary cementitious materials adding up to at least 40% by mass of the total amount of cementitious material to be used in the concrete mix.

The ratio of the amount of free water to the amount of cementitious material used in concrete in a corrosive environment shall not exceed 0.40.

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 PRECAST CONCRETE QUALITY CONTROL

GENERAL

Precast concrete quality control shall conform to these special provisions.

Unless otherwise specified, precast concrete quality control shall apply when any precast concrete members are fabricated in conformance with the provisions in Section 49, "Piling," or Section 51, "Concrete Structures," of the Standard Specifications.

Precast concrete quality control shall not apply to precast concrete members that are fabricated from minor concrete.

Quality Control (QC) shall be the responsibility of the Contractor. The Contractor's QC inspectors shall perform inspection and testing prior to precasting, during precasting, and after precasting, and as specified in this section and additionally as necessary to ensure that materials and workmanship conform to the details shown on the plans, and to the specifications.

Quality Assurance (QA) is the prerogative of the Engineer. Regardless of the acceptance for a given precast element by the Contractor, the Engineer will evaluate the precast element. The Engineer will reject any precast element that does not conform to the approved Precast Concrete Quality Control Plan (PCQCP), the details shown on the plans, or to these special provisions.

The Contractor shall designate in writing a precast Quality Control Manager (QCM) for each precasting facility. The QCM shall be responsible directly to the Contractor for the quality of precasting, including materials and workmanship, performed by the Contractor and all subcontractors. The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall not be employed or compensated by any subcontractor, or other persons or entities hired by subcontractors, or suppliers, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Prior to submitting the PCQCP required herein, a meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing precast concrete operations for this project, shall be held to discuss the requirements for precast quality control.

QC Inspectors shall either be 1) licensed as Civil Engineers in the State of California, or 2) have a current Plant Quality Personnel Certification, Level II, from the Precast/Prestressed Concrete Institute. A QC Inspector shall witness all precast concrete operations.

PRECAST CONCRETE QUALIFICATION AUDIT

Unless otherwise specified, no Contractors or subcontractors performing precast concrete operations for the project shall commence work without having successfully completed the Department's Precast Fabrication Qualification Audit, hereinafter referred to as the audit. Copies of the audit form, along with procedures for requesting and completing the audit, are available at:

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

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

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

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

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

PRECAST CONCRETE QUALITY CONTROL PLAN

Prior to performing any precasting operations, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings," of these special provisions, 3 copies of a separate PCQCP for each item of work to be precast. A separate PCQCP shall be submitted for each facility. As a minimum, each PCQCP shall include the following:

A. The name of the precasting firm, the concrete plants to be used, and any concrete testing firm to be used;
B. A manual prepared by the precasting firm that includes equipment, testing procedures, safety plan, and the names, qualifications, and documentation of certifications for all personnel to be used;
C. The name of the QCM and the names, qualifications, and documentation of certifications for all QC inspection personnel to be used;
D. An organizational chart showing all QC personnel and their assigned QC responsibilities;
E. The methods and frequencies for performing all required quality control procedures, including all inspections, material testing, and any required survey procedures for all components of the precast elements including prestressing systems, concrete, grout, reinforcement, steel components embedded or attached to the precast member, miscellaneous metal, and formwork;
F. A system for identification and tracking of required precast element repairs, and a procedure for the reinspection of any repaired precast element. The system shall have provisions for a method of reporting nonconforming precast elements to the Engineer; and
G. Forms to be used for Certificates of Compliance, daily production logs, and daily reports.

The Engineer shall have 4 weeks to review the PCQCP submittal after a complete plan has been received. No precasting shall be performed until the PCQCP is approved in writing by the Engineer.

A PCQCP that was previously 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 PCQCP is for the same type of work that is to be performed on this contract.

An amended PCQCP or addendum shall be submitted to, and approved in writing by the Engineer, for any proposed revisions to the approved PCQCP. An amended PCQCP or addendum will be required for any revisions to the PCQCP, including but not limited to changes in concrete plants or source materials, changes in material testing procedures and testing labs, changes in procedures and equipment, changes in QC personnel, or updated systems for tracking and identifying precast elements. The Engineer shall have 2 weeks to complete the review of the amended PCQCP or addendum, once a complete submittal has been received. Work that is affected by any of the proposed revisions shall not be performed until the amended PCQCP or addendum has been approved.

After final approval of the PCQCP, amended PCQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of each of these approved documents.

It is expressly understood that the Engineer's approval of the Contractor's PCQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. The Engineer's approval shall neither constitute a waiver of any of the requirements of the plans and specifications nor relieve the Contractor of any obligation thereunder; and defective work, materials, and equipment may be rejected notwithstanding approval of the PCQCP.

REPORTING

The QC Inspector shall provide reports to the QCM on a daily basis for each day that precasting operations are performed.

A daily production log for precasting shall be kept by the QCM for each day that precasting operations, including setting forms, placing reinforcement, setting prestressing steel, casting, curing, post tensioning, and form release, are performed. The log shall include the facility location, and shall include a specific description of casting or related operations, any problems or deficiencies discovered, any testing or repair work performed, and the names of all QC personnel and the specific QC inspections they performed that day. The daily report from each QC Inspector shall also be included in the log. This daily log shall be available for viewing by the Engineer, at the precasting facility.

All reports regarding material tests and any required survey checks shall be signed by the person who performed the test or check, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or type-written next to all signatures.

The Engineer shall be notified immediately in writing when any precasting problems or deficiencies are discovered and of the proposed repair or process changes required to correct them. The Engineer shall have 4 weeks to review these procedures. No remedial work shall begin until the Engineer approves these procedures in writing.

The following items shall be included in a precast report that is to be submitted to the Engineer following the completion of any precast element:

A. Reports of all material tests and any required survey checks;
B. Documentation that the Contractor has evaluated all tests and corrected all rejected deficiencies, and all repairs have been re-examined with the required tests and found acceptable; and
C. A daily production log.

At the completion of any precast element, and if the QCM determines that element is in conformance with these special provisions, 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. This Certificate of Compliance shall be submitted with the precast report. 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 and the provisions of the Standard Specifications and these special provisions.

PAYMENT

In the event the Engineer fails to complete the review of 1) a PCQCP, 2) an amended PCQCP or addendum, or 3) a proposed repair or process change, 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.

All required repair work or process changes required to correct precasting operation deficiencies, whether discovered by the QCM, QC Inspector, or by the Engineer, and any associated delays or expenses to the Contractor caused by performing these repairs, shall be at the Contractor's expense.

Full compensation for conforming to the requirements of this section 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 8-3. WELDING

8-3.01 WELDING

GENERAL

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

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

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

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

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

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

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

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

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

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

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

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

Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 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.

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

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

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

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

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:

A. Certified NDT Level II technicians, or;
B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

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

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Except as provided for in these special provisions, additional NDT required by the Engineer, and associated repair work, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Prior to release of welded material by the Engineer, if testing by NDT methods other than those originally specified discloses an attempt to defraud or reveals a gross nonconformance, all costs associated with the repair of the deficient area, including NDT of the weld and of the repair, and any delays caused by the repair, shall be at the Contractor’s expense. A gross nonconformance is defined as the sum of planar type rejectable indications in more than 20 percent of the tested length.

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

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

WELDING QUALITY CONTROL

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

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

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

In addition, welding quality control shall apply when welding is performed for the following work:

1. Bikepath Expansion Joint
2. Bikepath Railing
3. Bikepath steel grating
4. Seismic Joint
5. PTFE spherical bearing
6. Service platform steel decking
7. Barrier cover plates

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings," of these special provisions, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

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

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

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

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

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

The WQCP shall include four copies each of all AWS welding codes which are applicable to the welding to be performed. These codes shall become the permanent property of the Department.

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

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

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

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

The following information shall be clearly written on the outside of radiographic envelopes: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description, and all included weld numbers, report numbers, and station markers or views, as detailed in the WQCP. In addition, all interleaves shall have clearly written on them the part description and all included weld numbers and station markers or views, as detailed in the WQCP. A maximum of 2 pieces of film shall be used for each interleave.

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

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

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

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

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

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

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

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

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

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

A. Unless considered prequalified, fillet welds shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR).
B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, a minimum of 2 WPS qualification tests are required. The tests shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.1 shall be conducted in conformance with AWS D1.5, Clause 5.12 or 5.13. The test conforming to Figure 5.3 shall be conducted using the welding electrical parameters that were established for the test conducted conforming to Figure 5.1. The ranges of welding electrical parameters established during welding per Figure 5.1 in conformance with AWS D1.5, Clause 5.12, shall be further restricted according to the limits in Table 5.3 during welding per Figure 5.3.
C. Multiple zones within a weld joint may be qualified. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.5 Clause 5.13 shall be consistent for each pass in a weld joint, and shall in no case vary by more than ±10 percent for travel speed, ±10 percent for amperage, and ±7 percent for voltage as measured from a predetermined target value or average within each weld pass or zone. The travel speed shall in no case vary by more than ±15 percent when using submerged arc welding.
D. For a WPS qualified in conformance with AWS D1.5 Clause 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Clause 5.12 or 5.13.
E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Clause 5.19.3.

F. When a nonstandard weld joint is to be made using a combination of WPSs, a test conforming to Figure 5.3 may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 5.3.
G. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 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 Clause 6.26.2, excluding Clause 6.26.2.2. Test plates that do not comply with both tests shall not be used.

WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES

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

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor or by other persons or entities hired by subcontractors who will provide other services or materials for the project except for when the welding is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program. The AISC Certification category for overhead sign structures shall be Simple Steel Bridge Structures (SBR), and the AISC Certification category for pole structures shall be Simple Steel Bridge Structures (SBR) or Standard for Steel Building Structures (STD).

Welding Qualification Audit

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

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

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

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

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

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

Welding Report

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

STEEL PIPE PILING QUALIFICATION AUDIT

The Contractor shall submit documentation that one of the following steel pipe piling qualification audits has been successfully completed before welding operations are performed, other than field welding, for steel pipe piling:

A. "Class R Steel Pipe Piling Qualification Audit"
B. "Class N Steel Pipe Piling Qualification Audit"

An audit shall have been completed for each pipe pile diameter, thickness, grade of steel, and class of piling to be supplied for this project. The procedures for requesting and completing the audit are available at:

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

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

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

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

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

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 the following as shown on the plans:

SAN FRANCISCO OAKLAND BAY BRIDGE
OAKLAND APPROACH STRUCTURES, PHASE 2
(Bridge No. 34-0006 L/R)

Constructing a four-span cast-in-place prestressed concrete box girder superstructure approximately 144 meters long and 26 meters wide for the eastbound Route 80 (Frame 2 only), and abutment E23R on precast prestressed piles.

Constructing cast-in-place support beams, edge beams, precast concrete slabs and bikepath railings for approximately 167 meters long bikepath for the eastbound Route 80 (Frame 2 and partially on Frame 1), including a bikepath abutment on precast prestressed piles.

Installing seismic joints, concrete barriers, and roadway lighting on the bridges, and placing the polyester concrete overlay.

Removing a reinforced concrete eastbound temporary Bent 19AR on cast-in-steel-shell piles, from the eastbound Oakland Approach Structure.

Removing "Acrow Bridge" consisting of a steel truss with steel deck approximately 33 meters long, and metal ramps, bearing assemblies, and grout pads near Pier E16 on the Skyway Structure.

Removing portion of existing San Francisco Oakland Bay Bridge (Br. No. 33-25) as shown on the plans.

EAST SPAN SFOBB STRUCTURE
CABLE RAILING REMOVAL AND DECK SURFACE TREATMENT
(Bridge No. 34-0006 L/R)

Providing methacrylate resin treatment on deck surface for portion of existing Skyway Structures with concrete deck surface and on existing and new Oakland Approach Structures.

Removing existing cable railing on Skyway Structures and existing portions of Oakland Approach Structures.

PRECAST WALL, UTILITY VAULT, AND SIGN FOUNDATION
(Bridge No. 34-0006 R)

Constructing precast concrete wall with reinforced concrete barrier slab and reinforcement extending into lightweight embankment material (cellular concrete) at Abutment E23R for eastbound Oakland Approach Structure.

Constructing reinforced concrete utility vault at Abutment E23R of eastbound Oakland Approach Structure.

Constructing reinforced concrete foundation on cast-in-steel shell concrete piles for overhead signs along roadway east of Abutment E23R of eastbound Oakland Approach Structure.

OUTFALL BRIDGE AT WEST END MAINTENANCE YARD
(Bridge No. 33-0742Y)

Constructing a single span precast concrete slab bridge approximately 10 meters long and 13 meters wide on piles.

OAKLAND APPROACH BIKE PATH RAMP AND LANDING

Constructing reinforced concrete slab approximately 200 meters long and varying from 5 to 22 meters in width.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

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

The eastbound Frame 2 (Hinge FE to Abutment E23R) construction sequence shall conform to the requirements shown on the plans and in the order prescribed herein:

A. Survey eastbound Frame 1 at Hinge FE to verify deck elevations prior to design of falsework for eastbound Frame 2. Complete the erection of falsework Frame 2 from Hinge FE to Abut E23R. Cast and post tension Frame 2 of the Oakland Approach Structure.
B. Jack up superstructure adjacent to west side of Hinge FE at temporary Bent E19AR as directed by Engineer, to compensate for settlement of temporary Bent E19AR, to maintain the structure elevation shown on the plans and to align with the Frame 2 superstructure.
C. Construct hinge diaphragms and Hinge FE concrete closure pour.

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 "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).

The first order of work shall be to place the order for the electrical equipment.

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

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

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 2 weeks 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. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

The Contractor shall allow at all times an 8m wide access route throughout the project work limits for use by the Engineer and other Contractors until the San Francisco Oakland Bay Bridge (Bridges No. 34-0006 L/R) is open to public traffic. The Contractor shall provide the Engineer a plan indicating the access route. The Contractor shall notify the Engineer and provide a revised plan 14 days in advance of any change in the access route.

After the San Francisco Oakland Bay Bridge (Bridges No. 34-0006 L/R) is open to public traffic and until contract completion, the Contractor shall allow an 8 meter wide access route to the existing San Francisco Oakland Bay Bridge (Bridge No. 33-0025) for use by the Engineer and other Contractors. The access route shall be provided through the existing eastbound Route 80 detour. The Contractor shall notify the Engineer and provide a revised plan 14 days in advance of any change in the access route.

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

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

Prior to applying hot mix asphalt concrete paving or polyester concrete overlay, the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the hot mix asphalt concrete paving or polyester concrete overlay has been placed. After completion of the hot mix asphalt concrete paving or polyester concrete overlay 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 hot mix asphalt concrete or per square meter for polyester concrete overlay as listed in the Engineer estimate, and no additional compensation will be allowed therefor.

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

At least 60 days before 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)" , and "Compost (Incorporate)," 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.

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

10-1.02 HEALTH AND SAFETY PLAN

GENERAL

This work includes preparing, submitting, and implementing a detailed Health and Safety Plan that addresses the health and safety of all field personnel, including State personnel.

The plan must identify potential health and safety hazards associated with existing hazardous substances and specifies work practices that must be used to protect workers from those hazards in conformance with the Department of Toxic Substances Control and CAL-OSHA regulations. At a minimum, the Health and Safety Plan must:

1. Identify key site safety personnel
2. Describe risks associated with the work
3. Describe training requirements
4. Describe appropriate personal protective equipment
5. Describe any site-specific medical surveillance requirements
6. Describe any periodic air monitoring requirements
7. Define appropriate site work zones
8. Describe any decontamination requirements

The Health and Safety Plan must be submitted at least 15 business days before beginning work that may expose personnel to hazardous substances for review and acceptance by the Engineer. Before submittal, you must have the Health and Safety Plan approved by an industrial hygienist certified by the American Board of Industrial Hygiene.

SAFETY TRAINING

Before performing work that may expose personnel to hazardous substances, all personnel, including State personnel, must complete a safety training program that communicates the potential health and safety hazards associated with work on the site and instructs the personnel in procedures for doing the work safely. The level of training provided must be consistent with the personnel's job function and conform to CAL-OSHA regulations. Do not start safety training until the Health and Safety Plan is accepted by the Engineer. Provide subsequent refresher training required until completion of the project. Provide a certification of completion of the safety training program to all personnel who successfully complete the training. Provide personal protective equipment required by State personnel to inspect the work. The number of State personnel requiring the above mentioned safety training program and personal protective equipment is ten (10).

PAYMENT

The contract lump sum price paid for health and safety plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing and implementing the Health and Safety Plan, complete in place, including safety training and personal protective equipment, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.03 TURBIDITY CONTROL

GENERAL

Summary

This work includes preparing a turbidity control plan, monitoring turbidity, and implementing control measures to limit transport of disturbed sediment during in-water construction operations.

Definitions

turbidity: A physical characteristic of water that is an expression of the optical property that causes light to be scattered and absorbed by particles and molecules rather than transmitted in straight lines through a water sample. Suspended matter or impurities that interfere with the clarity of the water cause turbidity. These impurities may include clay, silt, and finely divided inorganic and organic matter.

natural background turbidity: The ambient clarity of the water adjacent to the job site at locations not affected by the work.

nephelometric turbidity units (NTU): A standard measure of turbidity based on light scatter measured with a nephelometer.

receiving water: The water in or adjacent to the job site that may be impacted by sediment disturbance caused by construction activities

Submittals

Submit a turbidity control plan for in-water work for review and approval 30 days before beginning work in marine environments. Allow 15 days for review and approval of the plan. If revisions are required, revise and resubmit the plan within 10 days of receipt of the Engineer's comments and allow 5 days for review and approval of the revisions.

The Turbidity Control Plan must describe:

1. Equipment used to do in-water work,
2. Operation schedule,
3. Deployment of turbidity control measures,
4. Containment contingency,
5. Turbidity monitoring program.

The turbidity monitoring program must include daily inspection reports during in-water work. The reports must document water quality measurements, visual observations, including photographs, and inspection results in conformance with the requirements of this special provision and must be certified as true and accurate and signed by those who gather the information.

Submit plans and working drawings in accordance with "Working Drawings," of these special provisions. Furnish three initial copies of the plan to the Engineer and equal copies following subsequent revisions and updates. Final approval of the plan will be subject to field testing.

Demonstrate that the proposed turbidity control measures work as intended under actual working and field conditions. At the time of approval, incorporate the plan into the approved Storm Water Pollution Prevention Plan using the established amendment process described within "Water Pollution Control," of these special provisions.

The State is neither liable for failure to accept all or any portion of an originally submitted or revised turbidity control plan, nor for any delays to the work due to failure to submit an acceptable turbidity control plan.

Regulatory Water Quality Limitations

The receiving water quality limitations shall comply with the following:

1. Downstream turbidity to increase to more than 50 Nephelometric Turbidity Units (NTU) if the natural background turbidity is less than 50 NTU
2. Downstream turbidity to increase more than 10 percent above the natural background turbidity if the natural background turbidity is 50 NTU or greater
3. Normal ambient temperature to be altered more than 5 degrees F
4. Normal ambient pH to fall below 6.5, exceed 8.5, or change more than 0.5 units
5. Dissolved oxygen concentration to fall below 5.0 mg/L

CONSTRUCTION

Operation

All in-water work that can cause turbidity must have turbidity control measures implemented to ensure that turbidity complies with regulatory rules, policies, and permits.

Monitoring

Perform compliance monitoring for turbidity in conformance with regulatory rules, policies, permits, and a turbidity monitoring program described in the turbidity control plan.

Water Quality Measurements

Measure turbidity during in-water work as follows:

1. Take measurements at the background and receiving water sampling locations one hour before starting the work to assess the relative conditions in the receiving water.
2. Start measuring in the receiving water 15 minutes after starting the work.
3. Measure every 2 hours during the work.
4. Take additional measurements whenever there is a noticeable effect on the color or clarity of the receiving water.
5. If a measurement exceeds the water quality limitations, confirm this exceedance by taking an additional measurement no more than 15 minutes after the initial measurement and confirm that the natural background condition has not changed.
6. Monitoring may be discontinued if, in the opinion of the Engineer, the receiving water measurements are consistently below the water quality limitations.
7. Measure the receiving water within 30.5 meters downstream (with the tide) of the work.
8. Measure the natural background turbidity at a location that is unaffected by the work, at least 91.4 meters (against the tide) of the work.

The receiving water and natural background measurements must be depth-averaged when the water depth is greater than 0.9 meter. Obtain depth-averaged measurements by taking measurements from 3 points within the water column and averaging the 3 measurements: one at 0.3 meter below the surface, one at mid depth, and one at 0.3 meter above the bottom. In receiving waters that are less than 0.9 meter in depth, only one measurement must be taken at 0.3 meter below the surface.

Obtain field-recorded data using a meter approved by the Engineer. The meter must be a handheld direct-reading instrument connected to a submersible turbidity sensor. Submit a copy of the manufacturer specifications for all measuring instruments used, including the operating instructions, calibration instructions, and calibration log, as part of the turbidity control plan submittal. Perform all field calibrations in conformance with the manufacturer's instructions in the presence of the Engineer. Transmit copies of the field-recorded data electronically to the Engineer at the end of each working day.

Visual Observation and Inspection

Before starting in-water work, inspect and document the existing condition of the receiving waters. Provide photo documentation of the surrounding work area extending 61.0 meters upstream and 61.0 meters downstream of the work.

Complete a daily inspection of the receiving water during in-water work. Observations must include:

1. The presence or absence of:

    1.1. Discoloration
    1.2. Odor
    1.3. Floating or suspended material
    1.4. Aquatic life
    1.5. Visible films, sheens or coatings
    1.6. Potential nuisance conditions

2. The wind direction and velocity
3. Tidal state
4. Time, and date

Supplement the observations with photographs and the name and signature of the person conducting the inspection.

If you do not conform to the provisions of "Turbidity Control," the Engineer will order the suspension of specific aquatic construction operations. No further work will be allowed on the ongoing operation until the turbidity control measures are adequate and, if required by the Engineer, a revised turbidity control plan is submitted, and accepted. Temporary suspension of work will conform to the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

If a deficiency in any aspect of the implementation of the approved turbidity control plan or amendments is identified, correct the deficiency immediately. You may correct the deficiency at a later date if approved by the Engineer in writing.

If the identified deficiency is not corrected by the date agreed upon, the project is in noncompliance.

The Engineer withholds 25 percent of the estimated value of the contract work performed during periods in which the project is in noncompliance as determined by the Engineer.

Removal

Remove and dispose of control measures in accordance 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 turbidity control will include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in turbidity control, complete in place, including development and submittal of the turbidity control plan, producing daily inspection reports, and removal and disposal of all control measures when no longer necessary, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.04 DEWATERING AND NON-STORM WATER DISCHARGE CONTROL

GENERAL

Summary

This work includes collection, conveyance, treatment, and discharge or disposal of accumulated precipitation and groundwater encountered during excavations for structures, roadways, and appurtenances. Groundwater within the job site is contaminated with petroleum hydrocarbons and discharges are subject to regulatory restrictions. This work includes designing, implementing, monitoring, maintaining, and later removing a dewatering and non-storm water discharge system. Comply with "Water Pollution Control," and "Construction Site Management," of these special provisions. Maintenance includes disposal of sediments and other material removed from the collection, conveyance and treatment systems.

The Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" (Preparation Manual) are available at:

http://www.dot.ca.gov/hq/construc/SWPPP_WPCP_Preparation.pdf

Discharge groundwater, impounded construction site water, or both, using any of the following methods:

1. Discharge into a Publicly Owned Treatment Works (POTW) facility (sanitary sewer) under a batch discharge permit. Apply for and comply with the provisions contained in the permit and pay all fees assessed by the POTW facility in connection with the discharge.
2. Discharge into a storm drain system under Order No. R2-2006-0075 adopted by the San Francisco Bay Regional Water Quality Control Board (RWQCB). Comply with "Relations with California Regional Water Quality Control Board," of these special provisions for discharges to the storm drain system. If the discharge is to the storm drain system, comply with the provisions of Order No. R2-2006-0075 and pay all fees in connection with obtaining coverage under the Order No. R2-2006-0075.
3. Use water treated under Order No. R2-2006-0075 for dust control.
4. Percolate water treated under Order No. R2-2006-0075 into soil in inactive work areas.

Maintain copies of the permits at the job site and make them available during construction.

Submittals

Before discharging submit:

1. Dewatering and discharge plan
2. POTW permit if applicable
3. Notice of Intent (NOI) of discharge under Order No. R2-2006-0075 if applicable
4. A report describing each component of the planned Groundwater Treatment System and an Operation and Maintenance Manual in conformance with Order No. R2-2006-0075 and these special provisions if applicable

Dewatering and Discharge Plan

The dewatering and discharge plan (DDP) must include:

1. Title sheet
2. Table of contents
3. Certification and approval sheet (Section 100 of the Preparation Manual)
4. Amendment log and format (Section 200 of the Preparation Manual)
5. Description and schedule of the dewatering and discharge operations
6. Description of discharge alternatives, including POTW, dust control, percolation, storm sewers, and surface waters
7. Description of any treatment system components

8. If you use chemical coagulants, in-line flocculants, or both, in the treatment system, submit a Coagulant Pollution Prevention Plan (CPPP) with the DDP. Chemical coagulants and flocculants proposed for use in the treatment of non-stormwater must comply with all provisions under "Active Treatment System (ATS) Requirements" within Attachment F Provisions D and E, in the National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges, associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ, NPDES No. CAS000002, available at:

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

   The CPPP must include:

   8.1. Description of the best management practices (BMPs) to prevent:

      8.1.1. Accidental spillage
      8.1.2. Overfeeding into the treatment system
      8.1.3. Other mishandling of coagulant agents

   8.2. Coagulant monitoring plan that complies with Provision E "Residual Chemical and Toxicity Requirements" within Attachment F in Order No. 2009-0009-DWQ.
   8.3. Description of the agent (chemical and trade name description)
   8.4. Pure product freshwater and marine aquatic toxicity data for the agent

9. Estimated flow rates
10. Operation and system maintenance procedures and example maintenance log for any treatment system
11. Field-recorded data, visual inspection, and calibration procedures and example logs
12. Measuring equipment descriptions
13. Working drawings of dewatering and discharge operations showing:

   13.1. Section and plan views of any effluent treatment system
   13.2. Location of sampling points for water quality measurements
   13.3. Flow path and placement of pipes, hoses, pumps, holding tanks, and other equipment used to convey water
   13.4. General position of dewatering, and discharge components relative to excavations or other operations requiring dewatering
   13.5. Point of discharge

Within 15 days after contract approval, submit 3 copies of the DDP to the Engineer. Allow 15 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. Revise and resubmit the DDP within 7 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete DDP is resubmitted. When the Engineer approves the DDP, submit 4 copies of the approved DDP to the Engineer. After approval, the Engineer will submit one copy of the approved DDP to the RWQCB for their review and comment. If the RWQCB provides comments to the DDP, the Contractor must amend the DDP. Dewatering activities may begin no sooner than 45 days after the Engineer approves the DDP. 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 because of the Engineer's or the RWQCB's review, you 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.

A Non-Stormwater Information Package (Information Package) has been prepared for this contract and is available as described in "Supplemental Project Information" of these special provisions. This Information Package includes:

1. Estimated groundwater seepage rates in the project area
2. RWQCB General Waste Discharge Requirements for Order No. R2-2006-0075, NPDES General Permit No. CAG912002
3. Local POTW facility information
4. Soil and groundwater sampling results

MATERIALS

Non-Storm Water Treatment and Discharge System

Design and implement an appropriate water treatment system for the site conditions and your estimated flow rate to achieve and maintain compliance with receiving water limitations and discharge effluent limitations. System components may include:

1. Treatment system.
2. Collection and conveyance system.
3. Temporary holding tanks.
4. Discharge attenuator.

Treatment Systems

Treatment systems must be designed to remove turbidity-producing suspended solids and petroleum hydrocarbons as listed in the soil and groundwater sampling results.

Attention is directed to "Supplemental Project Information," of these special provisions for obtaining a copy of the Site Investigation Report.

Primary and secondary treatment may be required, or the design of the treatment system may require combined use of the various treatment components in series to achieve effective treatment. Ensure that the treatment system components are steam cleaned to remove any residual contaminants. Treatment system components may include:

1. Desilting basins
2. Weir tanks
3. Settling tanks
4. Sediment traps
5. Gravity bag filters
6. Sand media filters
7. Pressurized bag filters
8. Cartridge filters
9. In-line chemical coagulants and/or flocculants
10. Activated clay filters
11. Activated carbon filters
12. A combination of these systems to provide primary and secondary treatment

Chemical coagulants and/or flocculants proposed for use in the treatment of groundwater must be approved by the RWQCB. You are fully and solely responsible for securing approval from the RWQCB. Written approval from the RWQCB must be submitted to the Engineer for review prior to any use of flocculants on this project. The Information Package includes an outline of the information required by the RWQCB for approval of the chemical coagulants and/or flocculants for use in the Treatment System.

Disposal of sediments removed during maintenance of the Treatment System must comply with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

If necessary, treat water discharged to surface water or storm drainage systems to adjust the pH, dissolved oxygen, and residual chemicals introduced by the treatment system. Treatment for water with high pH may include the addition of carbon dioxide, sulfuric acid, phosphoric acid, citric acid, or nitric acid in conformance with the supplier's specifications. Treatment for water with low pH may include filtration through a limestone bed or the addition of sodium hydroxide. Treatment for water with low dissolved oxygen may include aeration.

The various components must be maintained to prevent leaks and provide proper function. If a component of the dewatering equipment is not functioning properly, the dewatering operation must be discontinued and the component must be repaired or replaced.

Collection and Conveyance System

Provide all pumps and piping to convey the water to temporary holding tanks and the point of discharge.

Use a flow meter, as described in "Flow Rate Monitoring" of this section, to measure all discharges from dewatering operations.

Materials must conform to the provisions in Section 6, "Control of Materials," Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 74-2, "Drainage Pumping Equipment," of the Standard Specifications and these special provisions.

Temporary Holding Tanks

Water pumped during dewatering operations must be stored in temporary holding tanks placed at the work area for treatment to remove sediment.

Use temporary holding tanks including transportable closed top holding tanks or tanker trucks. A sufficient number of holding tanks shall be provided based on the following:

1. Anticipated flow rate
2. Pumping rates
3. Capacity inefficiencies due to sediment retention within the holding tanks
4. Sediment settling rates
5. Sediment removal frequency
6. Anticipated water loss or reuse rates

Provide temporary holding tanks with a holding capacity sufficient to handle the water removed from dewatering operations, and prevent delay of work.

Each temporary holding tank must have an inlet and outlet capable of receiving and discharging flows at a sufficient rate to dewater the excavation.

Maintain a minimum freeboard of 0.3 meter in each of the temporary holding tanks at all times. Clean the holding tanks when 25 percent of the tank's volume is filled with sediments.

CONSTRUCTION

Discharging Water

Use discharged treated water or uncontaminated ground or surface water for dust control in active work areas when possible, or discharge the water to an inactive area where the grade prevents sheet flow and the soil will allow percolation. The discharge point in the inactive area must include a velocity dissipater. The discharge volume must not exceed the area's capacity for percolation.

Do not discharge into a body of water where erosion, scour, or sedimentary deposits could occur that impact natural bedding or aquatic life. Monitor the water at the discharge point using water quality measurements and visual observation in conformance with the regulatory permit and these special provisions.

Storm water must be diverted away from excavations that would require dewatering.

Inspection, Monitoring, and Reporting

If treated groundwater is discharged to the storm drain system, perform compliance monitoring in conformance with the Monitoring and Reporting Program (MRP) included in Attachment E of the Order No. R2-2006-0075. If a batch discharge permit is obtained from a POTW, comply with the provisions contained in the batch discharge permit including all monitoring and reporting requirements.

During periods when the dewatering and non-storm water discharge operations occur, document the results in a Daily Inspection Report (DIR). The DIR form must include the discharge volume records and water quality monitoring records. In developing the DIR, refer to the Department's Dewatering Guide. The DIR form must be approved by the Engineer before use. The DIR must be provided weekly or as directed to the Engineer.

All information and recorded data collected or submitted as part of the DIR must be certified as true and accurate and signed by those who gather the information.

Visual Inspection

During each day of discharge, perform daily inspection of the effluent at the discharge site and include, in the DIR, observations of:

1. Date and Time.
2. Weather conditions,
3. Wind direction and velocity,
4. The presence or absence of water fowl or aquatic wildlife,
5. The color and clarity of the effluent discharge, and
6. Erosion or ponding downstream of the discharge site.

The DIR must include photographs of the discharge point and areas downstream of the discharge location. These photographs must be labeled with the time, date, and location.

Flow Rate Monitoring

A flow meter that has been approved by the Engineer for exclusive use in dewatering during construction must be used to measure all excavation discharges. All calibrations must be done in conformance with the manufacturer's instructions in the presence of the Engineer.

Record the flow-meter totalizer readings and compute average daily volumes for every day that dewatering is conducted.

Penalties and Withholdings

Know and comply with provisions of Federal, State, and local regulations and requirements that govern the work and storm water and non-storm water discharges from the job site and areas of disturbance outside the project limits during construction under Section 7-1.01, "Laws to be Observed," Section 7-1.11, "Preservation of Property," and Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

You are responsible for all penalties assessed as a result of your 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 include fines, penalties, and damages, whether proposed, assessed, or levied against the Department or you, 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 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.

The Department withholds payment, 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 a violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld until final disposition of these costs has been made. You remain liable for the full amount until the potential liability is finally resolved with the entity seeking the penalties. Instead of the withhold, you 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 violation of the permits, law, regulations, or requirements.

If a regulatory agency identifies a violation of the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold payment as follows:

1. The Department will give you 30 days notice of the Department's intention to withhold funds from payments that may become due before acceptance of the contract. After acceptance of the contract, funds will be withheld without prior notice.
2. If the amount being withheld from partial payments under Section 9-1.06, "Partial Payments," of the Standard Specifications exceeds the amount to be withheld for violations, no additional payment will be withheld.
3. If the Department withholds 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 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.

Notify the Engineer immediately upon request from a regulatory agency to enter, inspect, sample, monitor, or otherwise access the job site or obtain records pertaining to water pollution control work. Provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

PAYMENT

The contract lump sum price paid for dewatering and non-storm water discharge control includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in dewatering, including preparing the dewatering and discharge plan, implementing the MRP, obtaining all required permits, payment of fees for all permits and payment for discharge fees for disposal of treated water and sediments removed during maintenance of the treatment system as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

10-1.05 WATER POLLUTION CONTROL

GENERAL

Summary

This work includes developing and implementing a SWPPP for projects where soil disturbance from work activities will be 1 or more acres.

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

This project is Risk Level 2.

A Storm Water Information Handout has been prepared for this contract and is available as described in "Supplemental Project Information" of these special provisions.

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

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

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

For the above-referenced manuals, go to the Department's Web site for the Division of Construction, or the Department's publication distribution unit.

Do not start job site activities until:

1. The Engineer approves the SWPPP.
2. Waste discharge identification number is issued.
3. SWPPP review requirements have been fulfilled. If the RWQCB requires time for review, allow 30 days for the review as specified under "Submittals" of these special provisions. For projects in the Lake Tahoe Hydrologic Unit and the Mammoth Lakes Hydrologic Unit, the Lahontan RWQCB will review the SWPPP.

The following RWQCBs will review the approved SWPPP:

San Francisco Bay RWQCB (Region 2)

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

Contractor-support facilities include:

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

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

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

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

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

The following abbreviations are used in this special provision:

BMP: Best Management Practices.
CSMP: Construction Site Monitoring Program.
NAL: Numeric Action Level.
NEL: Numeric Effluent Limit.
NPDES: National Pollutant Discharge Elimination System.
QSD: Qualified SWPPP Developer.
QSP: Qualified SWPPP Practitioner.
REAP: Rain Event Action Plan.
RWQCB: Regional Water Quality Control Board.
SAP: Sampling and Analysis Plan.
SWPPP: Storm Water Pollution Prevention Plan.
SWRCB: State Water Resources Control Board.
WPC: Water Pollution Control.

Definitions

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

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

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

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

qualifying rain event: Storm that produces at least 12 mm of precipitation with a 48-hour or greater period between rain events.

storm event: Storm that produces or is forecasted to produce at least 2.5 mm of precipitation within a 24-hour period.

Submittals

General

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

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

At least 5 working days before operating any Contractor-support facility, submit to the Engineer:

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

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

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

Storm Water Pollution Prevention Plan

Within 20 days of Contract approval:

1. Submit 3 copies of your SWPPP to the Engineer for review. Allow 45 days for the Department's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.
2. Change and resubmit a revised SWPPP to the Engineer within 15 days of receiving the Engineer's comments. The Department's review resumes when a complete SWPPP has been resubmitted.
3. When the Engineer approves the SWPPP, submit an electronic copy and 4 printed copies of the approved SWPPP to the Engineer.
4. If the RWQCB requires review of the approved SWPPP, the Engineer submits the approved SWPPP to the RWQCB for its review and comment.
5. If the Engineer orders changes to the SWPPP based on the RWQCB's comments, amend the SWPPP within 10 days.

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

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

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

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

Include the following items in the SWPPP:

1. For all projects:

    1.1. Schedule
    1.2. CSMP

2. For risk level 2 projects add:

    2.1. Adherence to effluent standards for NALs
    2.2. REAP

3. For risk level 3 projects add:

    3.1. Adherence to effluent standards for NALs and NELs
    3.2. REAP

The SWPPP schedule must show when:

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

Amend and resubmit the SWPPP:

1. Annually before July 15th
2. Whenever:

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

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

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

1. For all projects:

    1.1. Visual monitoring procedures
    1.2. SAP for non-visible pollutants
    1.3. SAP for non-stormwater discharges
    1.4. SAP for monitoring required by RWQCB

2. For risk level 2 projects add:

    2.1. SAP for pH and turbidity

3. For risk level 3 projects add:

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

Describe the following water quality sampling procedures in the SAP:

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

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

Include procedures for sample collection during precipitation.

List conditions when you will not be required to physically collect samples such as:

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

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

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

The SAP for non-visible pollutants must describe the sampling and analysis strategy for monitoring non-visible pollutants.

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

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

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

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

The SAP for non-visible pollutants must provide sampling procedures and a schedule for:

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

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

Annual Certification

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

Site Inspection Reports

The WPC manager must submit the following to the Engineer within 24 hours of completing a weekly inspection:

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

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

Visual Monitoring Reports

Submit visual monitoring reports to the Engineer for:

1. Each storm event. Include:

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

        1.2.1. Within 2 working days before the storm for:

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

        1.2.2. Every 24 hours during the storm event for:

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

        1.2.3. Within 2 working days after the qualifying rain event for:

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

2. Non-stormwater discharges during each of the following periods:

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

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

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

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

4. Corrective action taken

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

Sampling and Analysis

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

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

Whenever a NAL is exceeded notify the Engineer and submit a NAL exceedance report to the Engineer within 48 hours after conclusion of a storm event. The report must include:

1. Field sampling results and inspections, including:

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

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

Whenever a NEL is exceeded, notify the Engineer and submit a NEL violation report to the Engineer within 6 hours. The report must include:

1. Field sampling results and inspections, including:

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

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

Rain Event Action Plan

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

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

The REAP must include:

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

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

4. Storm information (include printout of NWS forecast)

5. Description of:

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

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

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

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

6. Flood contingency measures

Storm Water Annual Report

Submit a Storm Water Annual Report to the Engineer before July 15th if construction occurs from July 1st through June 30th or within 15 days after Contract acceptance if construction ends before June 30th. Submit 2 copies of the report. Allow 10 days for the Engineer's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required. A Storm Water Annual Report must cover the preceding period from July 1st to June 30th.

Obtain the Engineer's approval for the format of the Storm Water Annual Report. The report must include:

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

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

3. Documentation of training for individuals responsible for:

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

Submit a revised report to the Engineer within 5 working days of receiving the Engineer's comments. The Engineer's review resumes when a complete report has been resubmitted.

When the Engineer approves the Storm Water Annual Report, submit 1 electronic copy and 2 printed copies of the report signed by the WPC manager to the Engineer.

Quality Control and Assurance

Training

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

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

1. Provide stormwater training in the following subjects:

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

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

2. Conduct weekly training meetings covering:

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

Training for personnel who collect water quality samples must include:

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

Sampling and Analysis

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

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

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

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

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

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

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

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

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

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

Numeric Action Levels

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

Numeric Action Levels

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

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

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

Numeric Effluent Limits

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

Numeric Effluent Limits

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

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

The daily average sampling results must not exceed the NEL for pH.

Water Pollution Control Manager

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

The QSD must:

1. Have completed the stormwater management training described in the Department's Web site for the Division of Construction,
2. Be registered or certified for at least one of the following:

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

The QSP must comply with the qualifications for a QSD or must:

1. Have completed the stormwater management training described in the Department's Web site for the Division of Construction,
2. Be certified for at least one of the following:

    2.1. Certified Erosion, Sediment and Storm Water Inspector (CESSWI)™ registered through Enviro Cert International, Inc.
    2.2. Certified Inspector of Sediment and Erosion Control (CISEC) registered through CISEC, Inc.

The WPC manager must:

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

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

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

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

MATERIALS

Not Used

CONSTRUCTION

General

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

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

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

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

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

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

Continue SWPPP implementation during any suspension of work activities.

Monitoring

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

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

Inspections

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

The WPC manager must oversee:

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

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

2. Daily inspections of:

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

3. Inspections of:

3.1. Vehicle and equipment cleaning facilities:

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

3.2. Vehicle and equipment maintenance and fueling areas:

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

3.3. Vehicles and equipment at the job site for leaks and spills on a daily schedule. Verify that operators are inspecting vehicles and equipment each day of use.
3.4. Demolition sites within 15.24 meters of storm drain systems and receiving waters daily.
3.5. Pile driving areas for leaks and spills:

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

3.6. Temporary concrete washouts:

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

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

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

3.8. Dewatering work:

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

3.9. Temporary active treatment system:

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

3.10. Work over water:

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

Deficiencies

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

1. Immediately, unless the Engineer approves a later date
2. Before precipitation occurs

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

Rain Event Action Plan

Have a REAP at the job site at least 24 hours before a forecasted storm event. The WPC manager must submit the REAP to the Engineer on the following forms:

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

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

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

Sampling and Analysis Day

Sampling and analysis day work must comply with the project's CSMP.

For a risk level 2 or risk level 3 project, collect samples:

1. During a storm event for:

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

2. During a qualifying rain event for:

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

Perform sample collection for sampling and analysis day work during:

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

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

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

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

Document sample collection during precipitation.

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

Storm Water Annual Report

Report on results of monitoring, inspections, sampling and analysis, including training, and laboratory reports.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for Prepare Storm Water Pollution Prevention Plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in developing and implementing a SWPPP, including preparing the SWPPP, obtaining SWPPP approval, amending the SWPPP, preparing a CSMP and a SAP, providing a WPC manager, conducting water pollution control training, and monitoring, inspecting and correcting water pollution control practices at the job site, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

For projects with 60 working days or less, payments for Prepare Storm Water Pollution Prevention Plan are made as follows:

1. After the Engineer approves the SWPPP, the Department includes up to 75 percent of the contract item price for Prepare Storm Water Pollution Prevention Plan in the monthly progress estimate
2. After contract acceptance, the Department pays for the remaining percentage of the contract item price for Prepare Storm Water Pollution Prevention Plan

For projects with more than 60 working days, payments for Prepare Storm Water Pollution Prevention Plan are made as follows:

1. After the Engineer approves the SWPPP, the Department includes up to 50 percent of the contract item price for Prepare Storm Water Pollution Prevention Plan in the monthly progress estimate
2. The Department pays 40 percent of the contract item price for Prepare Storm Water Pollution Prevention Plan over the life of the contract
3. After contract acceptance, the Department pays for the remaining 10 percent of the contract item price for Prepare Storm Water Pollution Prevention Plan

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

The Department does not adjust payment for an increase or decrease in the quantity of Rain Event Action Plan. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

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

The Department does not adjust payment for an increase or decrease in the quantity of Storm Water Annual Report. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The work to complete the final Storm Water Annual Report contract item is excluded from Section 7-1.17, "Acceptance of Contract," of the Standard Specifications.

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

The Department does not adjust payment for an increase or decrease in the quantity of Storm Water Sampling And Analysis Day. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

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

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

The Department does not pay for implementation of water pollution control practices in areas outside the highway right-of-way not specifically provided for in the plans or special provisions.

The Department does not pay for water pollution control practices installed at Contractor- support facilities.

Water pollution control practices for which there are separate contract items of work are measured and paid for as those items of work.

For each failure to submit a completed Storm Water Annual Report, the Department withholds $10,000. This withhold is in addition to other withholds under Section 9-1.053 "Performance Failure Withholds," of the Standard Specifications.

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

10-1.06 CONSTRUCTION SITE MANAGEMENT

GENERAL

Summary

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

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

The following abbreviations are used in this special provision:

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

Submittals

Before you start dewatering, submit a dewatering and discharge work plan in conformance with "Working Drawings," and "Water Pollution Control" of these special provisions. The dewatering and discharge work plan must include:

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

Submit the following:

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

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

MATERIALS

Not Used

CONSTRUCTION

Spill Prevention and Control

General

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

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

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

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

Minor Spills

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

Clean up a minor spill using the following procedures:

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

Semi-Significant Spills

Semi-significant spills consist of spills that can be controlled by a 1st responder with help from other personnel.

Clean up a semi-significant spill immediately using the following procedures:

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

Significant or Hazardous Spills

Significant or hazardous spills consist of spills that cannot be controlled by job site personnel.

Immediately notify qualified personnel of a significant or hazardous spill. Take the following steps:

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

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

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

Material Management

General

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

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

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

Use less hazardous materials if practicable.

The following activities must be performed at least 30.48 meters from concentrated flows of stormwater, drainage courses, and inlets if within the floodplain and at least 15.24 meters if outside the floodplain, unless otherwise approved by the Engineer:

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

Material Storage

If materials are stored:

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

Stockpile Management

Minimize stockpiling of materials at the job site.

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

Active and inactive soil stockpiles must be:

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

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

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

Stockpiles of pressure-treated wood must be:

1. Placed on pallets
2. Covered with impermeable material

Stockpiles of cold mix asphalt concrete must be:

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

Control wind erosion year round under Section 10, "Dust Control," of the Standard Specifications.

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

Waste Management

Solid Waste

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

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

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

Solid waste includes:

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

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

Hazardous Waste and Contamination

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

The WPC manager must:

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

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

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

Unanticipated Discovery of Asbestos and Hazardous Substances

Upon discovery of asbestos or a hazardous substance, comply with Section 7-1.01L, "Asbestos and Hazardous Substances," of the Standard Specifications.

Hazardous Waste Management Practices

Handle, store, and dispose of hazardous waste under 22 CA Code of Regs Div 4.5.

Use the following storage procedures:

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

Do not:

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

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

Dust Control for Hazardous Waste or Contamination

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

Stockpiling of Hazardous Waste or Contamination

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

Contractor-Generated Hazardous Waste

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

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

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

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

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

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

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

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

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

Department-Generated Hazardous Waste

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

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

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

Handle the containers such that no spillage occurs.

Hazardous Waste Transport and Disposal

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

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

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

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

Paint Waste

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

Concrete Waste

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

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

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

Sanitary and Septic Waste

Do not bury or discharge wastewater from a sanitary or septic system within the highway. A sanitary facility discharging into a sanitary sewer system must be properly connected and free from leaks. Place a portable sanitary facility at least 15.24 meters away from storm drains, receiving waters, and flow lines.

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

Liquid Waste

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

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

Hold liquid waste in structurally sound, leak-proof containers, such as roll-off bins or portable tanks.
Liquid waste containers must be of sufficient quantity and volume to prevent overflow, spills, and leaks.
Store containers at least 15.24 meters from moving vehicles and equipment.
Remove and dispose of deposited solids from sediment traps unless the Engineer approves another method.
Liquid waste may require testing to determine hazardous material content before disposal.
Dispose of drilling fluids and residue.
If a location approved by the Engineer is available within the job site, fluids and residue exempt under 23 CA Code of Regs § 2511(g) may be dried by evaporation in a leak-proof container. Dispose of the remaining as solid waste.

Nonstormwater Management

Water Control and Conservation

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

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

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

Illegal Connection and Discharge Detection and Reporting

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

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

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

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

Vehicle and Equipment Cleaning

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

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

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

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

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

Vehicle and Equipment Fueling and Maintenance

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

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

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

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

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

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

Material and Equipment Used Over Water

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

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

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

Structure Removal Over or Adjacent to Water

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

Paving, Sealing, Sawcutting, Grooving, and Grinding Activities

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

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

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

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

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

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

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

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

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

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

Thermoplastic Striping and Pavement Markers

Do not preheat, transfer, or load thermoplastic within 15.24 meters of drainage inlets and receiving waters.

Do not unload, transfer, or load bituminous material for pavement markers within 15.24 meters of drainage inlets and receiving waters.

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

Pile Driving

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

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

Concrete Curing

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

Minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when concrete is curing.

Concrete Finishing

Collect and dispose of water and solid waste from high-pressure water blasting under "Waste Management" of these special provisions. Collect and dispose of sand and solid waste from sandblasting under "Waste Management" of these special provisions. Before sandblasting, cover drainage inlets within 15.24 meters of sandblasting. Minimize the drift of dust and blast material by keeping the nozzle close to the surface of the concrete. If the character of the blast residue is unknown, test it for hazardous materials and dispose of it properly.

Inspect containment structures for concrete finishing for damage before each day of use and before forecasted precipitation. Remove liquid and solid waste from containment structures after each work shift.

Sweeping

Sweep by hand or mechanical methods, such as vacuuming. Do not use methods that use only mechanical kick brooms.

Sweep paved roads at construction entrance and exit locations and paved areas within the job site:

1. During clearing and grubbing activities
2. During earthwork activities
3. During trenching activities
4. During roadway structural-section activities
5. When vehicles are entering and leaving the job site
6. After soil-disturbing activities
7. After observing off-site tracking of material

Monitor paved areas and roadways within the project. Sweep within:

1. 1 hour whenever sediment or debris is observed during activities that require sweeping
2. 24 hours whenever sediment or debris is observed during activities that do not require sweeping

Remove collected material, including sediment, from paved shoulders, drain inlets, curbs and dikes, and other drainage areas. You may stockpile collected material at the job site under "Material Management" of these special provisions. If stockpiled, dispose of collected material at least once per week under "Waste Management" of these special provisions. A linear barrier must be installed to divert all run-on from coming in contact with collected debris.

You may dispose of sediment within the job site collected during sweeping activities. Protect the disposal areas against erosion.

Keep dust to a minimum during street sweeping activities. Use water or a vacuum whenever dust generation is excessive or sediment pickup is ineffective.

Remove and dispose of trash collected during sweeping under "Waste Management" of these special provisions.

Dewatering

Dewatering consists of discharging accumulated stormwater, groundwater, or surface water from excavations or temporary containment facilities.

Perform dewatering work as specified for the work items involved, such astemporary active treatment system or dewatering and discharge.

If dewatering and discharging activities are not specified under a work item and you perform dewatering activities:

1. Conduct dewatering activities under the Department's Field Guide for Construction Site Dewatering.
2. Ensure that any dewatering discharge does not cause erosion, scour, or sedimentary deposits that could impact natural bedding materials.
3. Discharge the water within the project limits. If the water cannot be discharged within project limits due to site constraints or contamination, dispose of the water as directed by the Engineer.
4. Do not discharge stormwater or nonstormwater that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface. Notify the Engineer immediately upon discovering any such condition.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for construction site management includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, waste management, nonstormwater management, and dewatering activities, including identifying, sampling, testing, handling, and disposing of hazardous waste resulting from your activities, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

10-1.07 STREET SWEEPING

GENERAL

Summary

This work includes street sweeping using machine-operated sweepers.

Street sweeping must comply with the specifications for sweeping in the Section titled, "Construction Site Management," of these special provisions except a machine-operated sweeper must be used.

Street sweeping does not void specifications for main residue collection included in other work activities, such as grooving, grinding, or asphalt concrete planing.

The SWPPP must describe and include the use of street sweeping as a water pollution control practice for sediment control and tracking control.

Submittals

At least 5 working days before you start clearing and grubbing, earthwork, or other activities with the potential for tracking sediment or debris, submit:

1. Number of machine-operated sweepers described in the SWPPP
2. Type of sweeper technology

Quality Control and Assurance

Retain and submit records of street sweeping, including:

1. Quantity of disposed sweeping waste
2. Sweeping times and locations

MATERIALS

Machine-operated sweepers must use one of the following technologies:

1. Mechanical sweeper followed by a vacuum-assisted sweeper
2. Vacuum-assisted dry (waterless) sweeper
3. Regenerative-air sweeper

CONSTRUCTION

At least 1 machine-operated sweeper must be on the job site at all times when street sweeping work is required. The sweeper must be in good working order.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.08 TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)

GENERAL

Summary

This work includes applying, maintaining, and removing temporary hydraulic mulch (bonded fiber matrix). Hydraulic mulch uses a mixture of fiber, tackifier, and water to stabilize active and nonactive disturbed soil areas.

The SWPPP must describe and include the use of temporary hydraulic mulch (bonded fiber matrix) as a water pollution control practice for soil stabilization.

Submittals

At least 5 business days before applying hydraulic mulch, submit:

1. Material Safety Data Sheet for the tackifier.
2. Product label describing the tackifier as an erosion control product.
3. List of pollutant indicators and potential pollutants for the use of temporary hydraulic mulch. Pollutant indicators are described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Preparation Manual.
4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the tackifier.
5. Composition of ingredients including chemical formulation.

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Tackifier
2. Fiber

Quality Control and Assurance

Retain and submit records of temporary hydraulic mulch applications including:

1. Compliance with specified rates
2. Application area
3. Application time
4. Quantity

MATERIALS

Tackifier

The tackifier must be:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Bonded to the fiber or prepackaged with the fiber by the manufacturer
5. At least 10 percent of the weight of the dry fiber and include the weight of the activating agents and additives
6. Organic, high viscosity colloidal polysaccharide with activating agents, or a blended hydrocolloid-based binder

Fiber

Fiber must be:

1. Long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips
2. Not made from sawdust, cardboard, paper, or paper byproducts
3. At least 25 percent of fibers 10 mm long
4. At least 50 percent held on a 710 μm sieve
5. Free from lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach
6. Free from synthetic or plastic materials
7. At most 7 percent ash

Coloring Agent

Use a biodegradable nontoxic coloring agent free from copper, mercury, and arsenic to ensure the hydraulic mulch contrasts with the application area.

CONSTRUCTION

Application

Apply temporary hydraulic mulch when an area is ready to receive temporary erosion control under "Move-in/Move-out (Temporary Erosion Control)."

Dilute hydraulic mulch with water to spread the mulch evenly.

Use hydroseeding equipment to apply hydraulic mulch.

Apply hydraulic mulch:

1. In the proportions indicated in the table below. Successive applications or passes may be needed to achieve the required proportion rate:

Material	Application Rate kg/ha
Bonded Fiber (includes fiber and tackifier material)	4000 kg/ha

2. To form a continuous mat with no gaps between the mat and the soil surface.
3. From 2 or more directions to achieve a continuous mat.
4. In layers to avoid slumping and to aid drying.
5. During dry weather or at least 24 hours before predicted rain.

Do not apply hydraulic mulch if:

1. Water is standing on or moving across the soil surface
2. Soil is frozen
3. Air temperature is below 4 ºC during the tackifier curing period unless allowed by the tackifier manufacturer and approved by the Engineer

Do not over-spray hydraulic mulch onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Reapply hydraulic mulch within 24 hours of discovering visible erosion unless the Engineer approves a longer period.

Removal

Remove hydraulic mulch by mechanically blending it into the soil with track laying equipment, disking, or other approved method.

Temporary hydraulic mulch disturbed or displaced by your vehicles, equipment, or operations must be reapplied at your expense.

Cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence are not included in the cost for performing maintenance.

MEASUREMENT AND PAYMENT

Temporary hydraulic mulch (bonded fiber matrix) is measured by the square meter from measurements along the slope of the areas covered by the hydraulic mulch.

The contract price paid per square meter for temporary hydraulic mulch (bonded fiber matrix) includes full compensation for furnishing all labor, materials, 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.

The State and you share the cost of maintaining the temporary hydraulic mulch. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.09 TEMPORARY COVER

Temporary cover 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 cover shall be one of the water pollution control practices for soil stabilization. The SWPPP shall include the use of temporary cover.

MATERIALS

Temporary Cover Fabric

Temporary cover fabric shall be either a geotextile (engineering fabric) or a geomembrane (plastic sheeting) conforming to the following requirements:

1. Geotextile shall be a woven, slit film fabric which is also known as woven tape. The fabric shall be nonbiodegradable, resistant to deterioration by sunlight, and inert to most soil chemicals. Edges of the film fabric shall be selvage or serge to prevent unraveling. The film fabric shall also conform to the following requirements:

Specification	Requirements
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	15
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	13.3
Permittivity, 1/sec, max. (liters per minute per square meter) ASTM Designation: D 4491	0.08 (244)
Ultraviolet light stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon arc lamp method)	70

* or appropriate test method for specific polymer

2. The geomembrane shall consist of 0.25-mm thick, single-ply material in conformance with the requirements in ASTM Designation: D 5199.

Temporary cover fabric shall be manufactured from polyethylene, polypropylene, or comparable polymers. The polymer materials may be virgin, recycled, or a combination of virgin and recycled materials. The polymer materials shall not 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 with the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Restrainers

Restrainers for securing the temporary cover fabric on slopes and stockpiles shall consist of one or a combination of the following:

1. Gravel-filled bags used as restrainers shall be knotted, roped, and placed at a maximum of 2 m apart on the temporary cover fabric as shown on the plans. Gravel-filled bags shall be between 13 kg and 22 kg in mass, between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width. Gravel bag fabric shall be nonwoven polypropylene geotextile with a minimum unit weight of 270 g/m^2. The fabric shall have a minimum grab tensile strength (25-mm grip) of 0.89-kN in conformance with the requirements in ASTM Designation: D 4632, and an ultraviolet (UV) stability of 70 percent tensile strength retained after 500 hours in conformance with the requirements in ASTM Designation: D 4355, xenon arc lamp method. Gravel shall consist of noncohesive material between 10 mm and 20 mm in diameter, free of clay balls, organic matter, and other deleterious material. The openings of gravel-filled bags shall be secured to prevent escape of gravel.

2. Restrainers consisting of a steel anchor with a wooden lath shall be fabricated and placed as shown on the plans. Wooden lath shall conform to the provisions in Section 20-2.12, "Lumber," of the Standard Specifications and shall be fir or pine, 38 mm x 89 mm in size, and 2.4 m in length. The wooden lath shall be secured to the temporary cover with steel anchors placed 1.2 m apart along the lath.

The Contractor may use an alternative restrainer if approved by the Engineer in writing. The Contractor shall submit details for an alternative restrainer to the Engineer before installation. The alternative restrainer shall be installed and maintained in conformance with these special provisions.

INSTALLATION

Temporary cover shall be installed as follows:

1. Temporary cover fabric shall be placed and anchored as shown on the plans.
2. Abutting edges of the temporary cover fabric shall overlap a minimum of 600 mm. Nonabutting edges shall be embedded in the soil a minimum of 150 mm.
3. Restrainers shall be placed at the overlap area and along the toe of the slope. Restrainers outside the overlap areas shall be placed at a maximum spacing of 2.4 m.
4. Steel anchors shall be installed to allow the leg of the steel anchor to pierce through the temporary cover fabric into the slope with the crown section securing the wooden lath firmly against the slope.
5. Earthen berm, a linear sediment barrier, shall be constructed adjacent to the toe of the slope with a minimum height of 200 mm and a minimum width of 940 mm. The earthen berm shall be hand or mechanically compacted. Alternative linear sediment barrier may be used if approved by the Engineer in writing.

If the Contractor removes the temporary cover in order to facilitate other work, the temporary cover shall be replaced and secured.

When no longer required as determined by the Engineer, temporary cover 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 cover shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

The Contractor shall maintain the temporary cover throughout the contract to prevent displacement or migration of the material on the slope or stockpiled.

Temporary cover shall be maintained to minimize exposure of the protected area. Restrainers shall be relocated and secured as needed to restrain the temporary cover fabric in place. Temporary cover that breaks free shall be immediately secured. Holes, tears, and voids in the temporary cover fabric shall be patched, repaired, or replaced. When patches or repairs are unacceptable as determined by the Engineer, the temporary cover shall be replaced.

Temporary cover shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary cover resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary cover to be paid for will be measured by the square meter for the actual area covered.

The contract price paid per square meter for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary cover, complete in place, including trench excavation and backfill, maintenance, and removal of temporary cover, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.10 TEMPORARY CONCRETE WASHOUT BIN

GENERAL

Summary

This work includes removal and disposal of concrete waste by furnishing, maintaining, and removing temporary concrete washout bins.

The SWPPP must describe and include the use of temporary concrete washout bins as a water pollution control practice for waste management and materials pollution control.

Submittals

At least 5 business days before concrete operations start, submit:

1. Location of the washout bins
2. Name and location of the off-site concrete waste disposal facility to receive concrete waste
3. Copy of the permit issued by RWQCB for the off-site commercial disposal facility
4. Copy of the license for the off-site commercial disposal facility
5. Copy of the permit issued by the state or local agency having jurisdiction over the disposal facility if the disposal site is located outside of the State of California

Quality Control and Assurance

Retain and submit records of disposed concrete waste including:

1. Weight tickets
2. Delivery and removal of concrete washout bins

MATERIALS

Concrete Washout Bin

Concrete washout bin must:

1. Be a commercially available watertight container
2. Have sufficient capacity to contain all liquid and concrete waste generated by washout operations without seepage or spills
3. Be not less than 4.2 cubic meters of capacity
4. Be a roll-off bin and may include folding steel ramps
5. Be labeled for the exclusive use as a concrete waste and washout facility

Concrete Washout Sign

Concrete washout sign must:

1. Comply with the provisions in Section 12-3.06B, "Portable Signs" of the Standard Specifications
2. Be approved by the Engineer
3. Consist of a base, framework and a sign panel
4. Be made out of plywood
5. Be a minimum size of 610 mm by 1200 mm
6. Read "Concrete Washout" with black letters, 75 mm high, on a white background

CONSTRUCTION

Placement

Place concrete washout bins at the job site:

1. Before concrete placement activities begin
2. In the immediate area of the concrete work as approved by the Engineer
3. No closer than 15 m from storm drain inlets, open drainage facilities, ESAs, or watercourses
4. Away from construction traffic or public access areas

Install a concrete washout sign adjacent to each temporary concrete washout bin location.

Operation

Use concrete washout bins for:

1. Washout from concrete delivery trucks
2. Slurries containing portland cement concrete or hot mix asphalt from sawcutting, coring, grinding, grooving, and hydro-concrete demolition
3. Concrete waste from mortar mixing stations

Relocate concrete washout bins as needed for concrete construction work.
Replace concrete washout bins when filled to capacity. Do not fill higher then 150 mm below rim.
Your WPC Manager must inspect concrete washout bins:

1. Daily if concrete work occurs daily
2. Weekly if concrete work does not occur daily

Maintenance

When relocating or transporting a concrete washout bin within the project site, secure the concrete washout bin to prevent spilling of concrete waste material. If any spilled material is observed, remove the spilled material and place it into the concrete washout bin.

Removal

Dispose of concrete waste material at a facility specifically licensed to receive solid concrete waste, liquid concrete waste, or both. Remove and dispose of concrete waste within 2 days of the concrete washout bin becoming filled to capacity.

MEASUREMENT AND PAYMENT

Temporary concrete washout bin is measured by the actual count of concrete washout bins in place.

The contract unit price paid for temporary concrete washout bin includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, maintaining, and removing the concrete washout bin, including removal and disposal of concrete waste, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.11 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 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 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 or unlined 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.

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 maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.12 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 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 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.

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.

10-1.13 TEMPORARY SILT FENCE

Temporary silt fence 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 silt fence shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary silt fence.

MATERIALS

Temporary silt fence shall either be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt Fence Fabric

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer 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).

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632*	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632*	15
Permittivity, 1/sec., min. ASTM Designation: D 4491	0.05
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

* or appropriate test method for specific polymer

Posts

Posts for temporary silt fence shall be one of the following:

1. Untreated fir or pine, a minimum of 34 mm x 40 mm in size, and 1.2 m in length. One end of the post shall be pointed.
2. Steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post before installation.

Fasteners

Fasteners for attaching silt fence fabric to posts shall be as follows:

1. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
2. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

INSTALLATION

Temporary silt fence shall be installed parallel with the slope contour in reaches not to exceed 150 m. A reach is considered a continuous run of temporary silt fence from end to end or from an end to an opening, including joined panels. Each reach shall be constructed so that the elevation at the base of the fence does not deviate from the contour more than 1/3 of the fence height.

The silt fence fabric shall be installed on the side of the posts facing the slope. The silt fence fabric shall be anchored in a trench as shown on the plans. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.

Mechanically pushing 300 mm of the silt fence fabric vertically through the soil may be allowed if the Contractor can demonstrate to the Engineer that the silt fence fabric will not be damaged and will not slip out of the soil resulting in sediment passing under the silt fence fabric.

The maximum post spacing may be increased to 3 m if the fence is reinforced by a wire or plastic material by prefabrication or by field installation. The field-assembled reinforced temporary silt fence shall be able to retain saturated sediment without collapsing.

Temporary silt fence shall be joined as shown on the plans. The tops of the posts shall be tied together by minimum of 2 wraps of tie wire of a minimum 1.5-mm diameter. The silt fence fabric shall be attached to the posts at the joint as specified in these special provisions.

When no longer required as determined by the Engineer, temporary silt fence 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. Trimming the silt fence fabric and leaving it in place will not be allowed.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground. When sediment exceeds this height 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 silt fence shall be repaired or replaced the same day the damage occurs. Damage to the temporary silt fence resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary silt fence to be paid for will be determined by the meter, measured parallel with the ground slope along the line of the installed temporary silt fence, deducting the widths of openings.

The contract price paid per meter for temporary silt fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary silt fence, complete in place, including trench 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.

10-1.14 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.

10-1.15 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 either Type 1 or 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.

10-1.16 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)

GENERAL

Summary

This work includes moving onto the project when an area is ready to receive temporary erosion control, 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 consists of any water pollution control practice for soil stabilization.

When notified by the Engineer that an area is ready for temporary erosion control, start erosion control work within 5 business days.

MEASUREMENT AND PAYMENT

Move-in/move-out (temporary erosion control) is measured as units from actual count. A move-in followed by a move-out is considered one unit.

The contract unit price paid for move-in/move-out (temporary erosion control) includes 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.

10-1.17 TEMPORARY DRAINAGE INLET PROTECTION

GENERAL

Summary

This work includes constructing, maintaining, and removing temporary drainage inlet protection. Drainage inlet protection settles and filters sediment before stormwater runoff discharges into storm drainage systems.

The SWPPP must describe and include the use of temporary drainage inlet protection as a water pollution control practice for sediment control.

Provide temporary drainage inlet protection to meet the changing conditions around the drainage inlet. Temporary drainage inlet protection must be:

1. Appropriate type to meet the conditions around the drainage inlet
2. Type 1, Type 2, Type 3A, Type 3B, Type 4A, Type 4B, Type 5, Type 6A, Type 6B, or a combination

Submittals

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Erosion control blanket
2. Fiber rolls
3. Safety cap for metal posts
4. Silt fence fabric
5. Sediment filter bag
6. Foam barrier
7. Rigid plastic barrier
8. Gravel-filled bag fabric

If you substitute the steel wire staple with an alternative attachment device, submit a sample of the device for approval at least 5 business days before installation.

MATERIALS

Geosynthetic Fabrics

Geosynthetic fabrics for temporary drainage inlet protection must consist of one of the following:

1. Polyester
2. Polypropylene
3. Combined polyester and polypropylene

Geosynthetic fabrics must comply with:

Water Pollution Control

Property	ASTM Designation	Application and Specification				
		Silt Fence		Sediment Filter Bag	Gravel-Filled Bags	Foam Barrier
		Woven	Non-woven			
Grab breaking load 25-mm grip, kilonewtons, min. in each direction	D 4632	0.53	0.53	1.13	0.91	0.89
Apparent elongation percent, min., in each direction	D 4632	15	50	50	50	15
Water Flow Rate max. average roll value, liters per minute per square meter	D 4491	405-2025	4050-6075	3251-8148	3251-6095	4074-6095
Permittivity 1/sec., min.	D 4491	0.05	0.05	1.5	1.2	0.05
Apparent opening size max. average roll value, mm	D 4751	0.600	0.600	0.425-0.850	0.850-1.70	0.850
Ultraviolet Degradation percent of original unexposed grab breaking load 500 hr, minimum	D 4595	70				

Sample under ASTM D 4354, Procedure C.

Test under ASTM D 4759. All properties are based on Minimum Average Roll Value (MARV).

Identify, store, and handle under ASTM D 4873.

Protect geosynthetics from moisture, sunlight, and damage during shipping and storage. Label each unit with the manufacturer's name, identifying information and product identification.

Erosion Control Blanket

Erosion control blanket must be:

1. Described as a rolled erosion control product (RECP)
2. Classified as temporary and degradable or long-term and non-degradable
3. Machine-made mats
4. Provided in rolled strips
5. Classified by the Erosion Control Technology Council (ECTC)

Erosion control blanket classified as temporary and degradable must be one of the following:

1. Double net excelsior blanket:

    1.1. Classified as ECTC Type 2D
    1.2. Classified as an erosion control blanket
    1.3. Designed to last for at least one year after installation
    1.4. With a Universal Soil Loss Equation (USLE) C-Factor of not more than 0.20 at a 1:2 (vertical:horizontal) slope
    1.5. With 80 percent of the wood excelsior fibers being 150 mm or longer
    1.6. Capable to withstand a maximum shear stress of 84 Pa under ASTM D 6460
    1.7. With a minimum tensile strength of 1.09 kN per meter under ASTM D 5035
    1.8. With top and bottom surfaces covered with lightweight non-synthetic netting

2. Double net straw and coconut blanket:

    2.1. Classified as ECTC Type 2D
    2.2. Classified as an erosion control blanket
    2.3. Designed to last for at least one year after installation
    2.4. With a USLE C-Factor of not more than 0.20 at a 1:2 (vertical:horizontal) slope
    2.5. Comprised of 70 percent straw and 30 percent coconut fiber
    2.6. Capable to withstand a maximum shear stress of 84 Pa under ASTM D 6460
    2.7. With a minimum tensile strength of 1.09 kN per meter under ASTM D 5035
    2.8. With top and bottom surfaces covered with lightweight non-synthetic netting

3. Jute netting:

    3.1. Classified as ECTC Type 3B
    3.2. Classified as an open weave textile and have from 14 to 20 strands per 305 mm in each direction
    3.3. Designed to last for at least one year after installation
    3.4. With a USLE C-Factor of not more than 0.25 at a 1:1.5 (vertical:horizontal) slope
    3.5. Comprised of 100 percent unbleached and undyed spun yarn made of jute fiber
    3.6. With an average open area from 63 to 70 percent
    3.7. From 1.22 to 1.83 m in width
    3.8. Capable to withstand a maximum shear stress of 96 Pa under ASTM D 6460
    3.9. With a minimum tensile strength of 1.45 kN per meter under ASTM D 5035
    3.10. From 0.34 to 0.45 kg per square meter in weight

4. Coir netting:

    4.1. Classified as ECTC Type 4
    4.2. Classified as an open weave textile and from 13 to 18 strands per 305 mm in each direction
    4.3. Designed to last for at least three years after installation
    4.4. With a USLE C-Factor of not more than 0.25 at a 1:1 (vertical:horizontal) slope
    4.5. Comprised of 100 percent unbleached and undyed spun coir yarn made of coconut fiber
    4.6. With an average open area from 63 to 70 percent
    4.7. From 1.82 to 4.0 m in width
    4.8. Capable to withstand a maximum shear stress of 108 Pa under ASTM D6460
    4.9. With a minimum tensile strength of 1.82 kN per meter under ASTM D 5035
    4.10. From 0.45 to 0.63 kg per square meter in weight

Erosion control blanket classified as long-term and non-degradable must:

1. Be a geosynthetic fabric
2. Comply with Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications for rock slope protection fabric (Type A)

Staples

You may use an alternative attachment device such as a geosynthetic pins or plastic pegs to install erosion control blanket.

Rock

Rock must comply with:

1. Requirements under Section 72-2.02, "Materials," of the Standard Specifications
2. Following sizes:

Square Screen Size (mm)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

Rope

Rope for fiber rolls must be:

1. Biodegradable, such as sisal or manila
2. At least 6.35 mm in diameter

Fiber Rolls

Fiber rolls must:

1. Last for at least one year after installation
2. Be Type 1 or Type 2

For Type 1, fiber rolls must be:

1. Made from an erosion control blanket classified as temporary and degradable
2. Rolled along the width
3. Secured with natural fiber twine every 2.15 m from each end
4. Finished to be either:

    4.1. From 200 to 250 mm in diameter, from 3.0 to 6.0 m long, and at least 0.74 kg per meter
    4.2. From 250 to 300 mm in diameter, at least 3.0 m long, and at least 2.97 kg per meter

For Type 2, fiber rolls must:

1. Be filled with rice or wheat straw, wood excelsior, or coconut fiber
2. Be covered with biodegradable jute, sisal, or coir fiber netting
3. Have netting secured tightly at each end
4. Be finished to be either:

    4.1. From 200 to 250 mm in diameter, from 3.0 to 6.0 m long, and at least 1.63 kg per meter
    4.2. From 250 to 300 mm in diameter, at least 3.0 m long, and at least 4.45 kg per meter

Wood Stakes

Wood stakes must be:

1. Untreated fir, redwood, cedar, or pine and cut from sound timber
2. Straight and free of loose or unsound knots and other defects which would render the stakes unfit for use
3. Pointed on the end to be driven into the ground

For fiber rolls, wood stakes must be at least:

1. 25 mm x 25 mm x 600 mm in size for Type 1 installation
2. 25 mm x 25 mm x 600 mm in size for Type 2 installation

Posts

Posts must be wood or metal.

Wood posts must be:

1. Untreated fir, redwood, cedar, or pine and cut from sound timber
2. Straight and free of loose or unsound knots and other defects that would render the stakes unfit for use
3. Pointed on the end to be driven into the ground
4. At least 50 mm x 50 mm in size, and 1.2 m long

Metal posts must:

1. Be made of steel
2. Have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads
3. Be pointed on the end to be driven into the ground
4. Weigh at least 1.1 kg/m
5. Be at least 1.2 m long
6. Have a safety cap attached to the exposed end. The safety cap must be orange or red plastic and fit snugly to the metal post

Silt Fence

Silt fence must be:

1. Constructed with silt fence fabric, posts, and fasteners
2. Prefabricated or assembled at the job site

Silt fence fabric must be attached to posts using these methods:

1. If prefabricated silt fence is used, posts must be inserted into sewn pockets
2. If assembled on the job site:

    2.1. If wood posts are used, fasteners must be staples or nails
    2.2. If steel posts are used, fasteners must be tie wires or locking plastic fasteners
    2.3. Spacing of the fasteners must be at least 200 mm

Gravel-filled Bags

Gravel-filled bags must:

1. Be made from fabric
2. Have inside dimensions from 600 to 800 mm in length, and from 400 to 500 mm in width
3. Have the opening bound to retain the gravel. The opening must be sewn with yarn, bound with wire, or secured with a closure device
4. Weigh from 13 to 22 kg when filled with gravel

Gravel for gravel-filled bags must be:

1. From 10 to 19 mm in diameter
2. Clean and free from clay balls, organic matter, and other deleterious materials

Sediment Filter Bag

Sediment filter bag must:

1. Be made of fabric
2. Be sized to fit the catch basin or drainage inlet
3. Include a high-flow bypass

Sediment filter bag may include a metal frame. Sediment filter bags that do not have a metal frame and are deeper than 450 mm must:

1. Include lifting loops and dump straps
2. Include a restraint cord to keep the sides of the bag away from the walls of the catch basin

Foam Barriers

Foam barriers must:

1. Be filled with a urethane foam core
2. Have a geosynthetic fabric cover and flap
3. Have a triangular, circular, or square shaped cross section
4. Have a vertical height of at least 125 mm after installation
5. Have a horizontal flap of at least 200 mm in width
6. Have a length of at least 1.2 m per unit
7. Have the ability to interlock separate units into a longer barrier so that water does not flow between the units
8. Be secured to:

    8.1. Pavement with 25 mm concrete nails with 25 mm washers and solvent-free adhesive
    8.2. Soil with 150 mm nails with 25 mm washers

Rigid Plastic Barriers

Rigid plastic barriers must:

1. Have an integrated filter
2. Have a formed outer jacket of perforated high density polyethylene (HDPE) or polyethylene terephthalate (PET)
3. Have a flattened tubular shaped cross section
4. Be made from virgin or recycled materials
5. Be free from biodegradable filler materials that degrade the physical or chemical characteristics of the finished filter core or outer jacket
6. Have a length of at least 1.2 m per unit
7. Have the ability to interlock separate units into a longer barrier so that water does not flow between the units
8. Be secured to:

    8.1 Pavement with 25 mm concrete nails with 25 mm washers and solvent-free adhesive, with gravel-filled bags, or a combination
    8.2 Soil with 150 mm nails with 25 mm washers and wood stakes

9. Comply with the following properties:

Specification	Requirements
Grab tensile strength of outer jacket material, kPa, min. in each direction ASTM D 4632*	27600
Break strength of outer jacket, kPa, ASTM D 4632*	8960
Permittivity of filter core, 1/sec., min. ASTM D 4491	0.38
Flow rate of filter core, , liters/square meter per second ASTM D 4491	67.8 min. 135.6 max.
Filter core aperture size, max., Average Opening Size (AOS), mm	0.43
Ultraviolet stability (outer jacket & filter core), percent tensile strength retained after 500 hours, min. ASTM D 4355 (xenon-arc lamp and water spray weathering method)	90

* or appropriate test method for specific polymer

If used at a curb inlet without a grate, rigid plastic barriers must:

1. Have a horizontal flap of at least 150 mm with an under-seal gasket to prevent underflows
2. Include a high-flow bypass
3. Have a vertical height of at least 175 mm after installation
4. Be sized to fit the catch basin or drainage inlet

If used at a grated catch basin without a curb inlet, rigid plastic barriers must:

1. Cover the grate by at least 50 mm on each side and have an under-seal gasket to prevent underflows
2. Include a high-flow bypass
3. Have a vertical height of at least 38 mm after installation
4. Be sized to fit the catch basin or drainage inlet

If used at a curb inlet with a grate, rigid plastic barriers must:

1. Have a horizontal flap that covers the grate by at least 50 mm on the 3 sides away from the curb opening and have an under-seal gasket to prevent underflows
2. Include a high-flow bypass
3. Have a vertical section that covers the curb opening by at least 125 mm after installation
4. Be sized to fit the catch basin or drainage inlet

If used as a linear sediment barrier, rigid plastic barriers:

1. Must have an installed height of at least 150 mm
2. May have a horizontal flap of at least 100 mm

Linear Sediment Barrier

Linear sediment barriers must consist of one or more of the following:

1. Silt fence
2. Gravel-filled bags
3. Fiber roll
4. Rigid plastic barrier
5. Foam barrier

Flexible Sediment Barrier

Flexible sediment barriers consist of one or more of the following:

1. Rigid plastic barrier
2. Foam barrier

CONSTRUCTION

For drainage inlet protection at drainage inlets in paved and unpaved areas:

1. Prevent ponded runoff from encroaching on the traveled way or overtopping the curb or dike. Use linear sediment barriers to redirect runoff and control ponding
2. Clear the area around each drainage inlet of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installing the drainage inlet protection
3. Install a linear sediment barrier 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

To install erosion control blanket and geosynthetic fabric:

1. Secure blanket or fabric to the surface of the excavated sediment trap with staples and embed in a trench adjacent to the drainage inlet
2. Anchor the perimeter edge of the erosion control blanket in a trench

Silt Fence

If silt fence is used as a linear sediment barrier:

1. Place fence along the perimeter of the erosion control blanket, with the posts facing the drainage inlet
2. Install fence with the bottom edge of the silt fence fabric in a trench. Backfill the trench with soil and compact manually

Gravel Bag Berm

If gravel bag berm is used as a linear sediment barrier:

1. Place gravel-filled bags end-to-end to eliminate gaps
2. Stack bags in a way that the bags in the top row overlap the joints in the lower row

If gravel bag berms are used for Type 3A and Type 3B:

1. Place gravel-filled bags end-to-end to eliminate gaps
2. Stack bags in a way that the bags in the top row overlap the joints in the lower row
3. Arrange bags to create a spillway by removing one or more gravel-filled bags from the upper layer

If used within shoulder area, place gravel-filled bags behind temporary railing (Type K).

Fiber Rolls

If fiber rolls are used as a linear sediment barrier:

1. Place fiber rolls in a furrow
2. Secure fiber rolls with stakes installed along the length of the fiber rolls. Stakes must be installed from 150 to 300 mm from the end of the rolls

If fiber rolls are used as a linear sediment barrier for Type 4A, place them over the erosion control blanket.

Foam Barriers

If foam barriers are used as a linear sediment barrier:

1. Install barriers with the horizontal flap in a 75 mm deep trench and secured with nails and washers placed no more than 1.2 m apart
2. Secure barriers with 2 nails at the connection points where separate units overlap
3. Place barriers without nails or stakes piercing the core

Flexible Sediment Barriers

If flexible sediment barriers are used:

1. Secure barriers to the pavement with nails and adhesive, gravel-filled bags, or a combination
2. Install barriers flush against the sides of concrete, asphalt concrete, or hot mix asphalt curbs or dikes
3. Place barriers to provide a tight joint with the curb or dike and anchored in a way that runoff cannot flow behind the barrier

If flexible sediment barriers are used for Type 4B:

1. Secure barriers to the pavement according to the angle and spacing shown on the plans
2. Place barriers to provide a tight joint with the curb or dike. Cut the cover fabric or jacket to ensure a tight fit

Rigid Sediment Barriers

If rigid sediment barriers are used at a grated catch basin without a curb inlet:

1. Place barriers using the gasket to prevent runoff from flowing under the barrier
2. Secure barriers to the pavement with nails and adhesive, gravel-filled bags, or a combination

If rigid sediment barriers are used for linear sediment barriers:

1. Install barriers in a trench. Backfill the trench with soil and compact manually
2. Place barrier with separate units overlapping at least 100 mm
3. Reinforce barriers with a wood stake at each overlap
4. Fasten barriers to the wood stakes with steel screws, 1.57 mm galvanized steel wire, or with UV stabilized cable ties that are from 125 to 175 mm in length

Sediment Filter Bags

Install sediment filter bags for Type 5 by:

1. Removing the drainage inlet grate
2. Placing the sediment bag in the opening
3. Replacing the grate to secure the sediment filter bag in place

MAINTENANCE

Maintain temporary drainage inlet protection to provide sediment holding capacity and to reduce runoff velocities.

Remove sediment deposits, trash, and debris from temporary drainage inlet protection as needed or when directed by the Engineer. If removed sediment is deposited within project limits, it must be stabilized and not subject to erosion by wind or water. Trash and debris must be removed and disposed of as specified in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Maintain temporary drainage inlet protection by removing sediment from:

1. Behind flexible sediment barriers when sediment exceeds 25 mm in depth
2. Surface of the erosion control blanket when sediment exceeds 25 mm in depth
3. Sediment trap for Type 2 when the volume has been reduced by approximately one-half
4. Behind silt fence when the sediment is 1/3 the height of the silt fence fabric above ground
5. Sediment filter bags when filled or when the restraint cords are no longer visible

If rills and other evidence of concentrated runoff occur beneath the linear sediment barrier, repair or adjust the barrier.

If silt fence fabric becomes split, torn, or unraveled, repair or replace silt fence.

If geosynthetic fabric becomes split, torn, or unraveled, repair or replace foam barriers.

Repair or replace sagging or slumping linear sediment barriers with additional stakes. Replace broken or split wood stakes.

Reattach foam barriers and rigid plastic barriers that become detached or dislodged from the pavement.

Repair split or torn rigid plastic barriers with 1.29 mm galvanized steel wire or UV stabilized cable ties that are from 125 to 175 mm in length.

For sediment filter bags without metal frames, empty by placing 25 mm steel reinforcing bars through the lifting loops and then lift the filled bag from the drainage inlet. For sediment filter bags with metal frames, empty by lifting the metal frame from the drainage inlet. Rinse before replacing in the drainage inlet. When rinsing the sediment filter bags, do not allow the rinse water to enter a drain inlet or waterway.

Repair temporary drainage inlet protection within 24 hours of discovering damage unless the Engineer approves a longer period.

If your vehicles, equipment, or activities disturb or displace temporary drainage inlet protection, repair temporary drainage inlet protection at your expense.

The Department does not pay maintenance costs for cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence.

REMOVAL

When the Engineer determines that the temporary drainage inlet protection is not required, it must be removed and disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary drainage inlet protection must be backfilled and repaired under Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT AND PAYMENT

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.

The contract unit price paid for temporary drainage inlet protection includes 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, 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 is relocated during the course of construction.

The State and you share the cost of maintaining the temporary drainage inlet protection. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.18 COOPERATION

It is anticipated that work by another contractor may be in progress adjacent to or within the limits of this project during progress of the work on this contract. The following table lists contracts anticipated to be in progress during this contract.

Contract No.	Co-Rte-KP	Location	Type of Work
04-0120F4	04-SF-80-KP 13.2/KP 13.9	Yerba Buena Island	Construct Self-Anchored Suspension Bridge Superstructure.
04-0120N4	04-SF-80-SF/Ala-KP 12.6/ KP 2.7	Yerba Buena Island	Install electrical systems.
04-0120S4	04-SF-80-KP 12.7/KP 13.2	Yerba Buena Island	Construct Yerba Buena Island Transition Structures, and Remove Bridge (Portion), Br. No. 34-25, during Bridge full closure provided by the 04-0120M4 Contractor.
04-0120T4	04-SF-80-KP 12.9/KP 13.2	Yerba Buena Island	Construct Yerba Buena Island Structures (portion), and reconstruct ramps and roadways.
04-43A644	04-SF-80-KP 12.3/KP 13.2	Yerba Buena Island	Construct WB-80 On and Off-Ramps.
04-292264	04-Ala-at Separation 80/580	Oakland from Maintenance Yard at Sta BP 94+20 to 1.2 km	Construct 1.2 km Bike Path
State Forces	Var	Var	Manage Changeable Message Signs (CMS) in coordination with Portable Changeable Message Signs placed by the Contractor, during San Francisco-Oakland Bay Bridge full closure.

Comply with Section 7-1.14, "Cooperation," of the Standard Specifications.

During Stage 2 Construction, the Contractor must cooperate with other Contractors, who perform the bridge removal (portion), Br. No. 34-25, upper deck westbound Route 80, between Bent 23 and Bent 39 as shown on the plans, and must provide traffic control system for the bridge full closure in conformance with "Maintaining Traffic," of these special provisions.

During the simultaneous 72 hour full closure of the eastbound and westbound Route 80, the Contractor shall coordinate traffic control system throughout Route 80 corridor with the Engineer and other Contractors performing work under the 04-0120F4 and 04-0120S4 contracts.

10-1.19 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

GENERAL

Summary

Comply with Section 8-1.04, "Progress Schedule," of the Standard Specifications, except you must:

1. Use a computer software to prepare the schedule
2. Furnish compatible software for the Engineer's exclusive possession and use

You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

Definitions

concurrent delay: Two or more delays occurring simultaneously or overlapping. Each delay when analyzed separately impacts the contract completion date.

contract completion date: The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer as specified in Section 8-1.06, "Time of Completion," of the Standard Specifications.

controlling operation: The activity considered at the time by the Engineer, within that series of activities defined as the critical path, which if delayed or prolonged, will delay the time of completion of the contract.

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."

delay: The time period during which some part of the construction project has been extended beyond what was originally planned due to unanticipated circumstances. A delay occurs when the respective activity or activities, requiring additional time, impacts the completion of the successor construction activity and also extends the scheduled contract completion date.

early completion time: The difference in time between an early scheduled completion date and the contract completion date.

float: The difference between the earliest and latest allowable start or finish times for an activity.

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.

narrative report: A document submitted with each schedule that discusses topics related to project progress and scheduling.

near critical path: A chain of activities with total float exceeding that of the critical path but having no more than 30 working days of total float.

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.

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.

time-scaled network diagram: A graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

total float: The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

Submittals

General Requirements

Submit to the Engineer baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Perform work in the sequence indicated on the current accepted schedule.

Each schedule must show:

1. All project characteristics, salient features and interfaces, including those with outside entities that could affect time of completion.
2. Calculations using the critical path method to determine controlling activities.
3. Duration activities less than 20 working days, unless otherwise approved by the Engineer.
4. At least 50 but not more than 1000 activities, unless authorized. The number of activities must be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.
5. Each required constraint. Constraints other than those required by the special provisions may be included only if authorized.
6. State-owned float as the predecessor activity to the scheduled completion date.
7. Activities with identification codes for responsibility, stage, work shifts, location, and contract pay item numbers.
8. All task activities must be assigned to a project calendar. Each calendar must identify a workweek and holidays. Different calendars must be used for work activities that occur on different work schedules. All non-activity periods for environmental work restrictions must be identified with the appropriate calendar.
9. Retained logic must be used when calculating the schedule.

You may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time is considered a resource for your exclusive use. You may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently, or by completing activities earlier than planned. You may also submit for approval a VECP as specified in Section 4-1.035B, "Value Engineering Change Proposal." of the Standard Specifications that will reduce time of construction.

You may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. Provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule. During any period showing a late scheduled completion, the Engineer may require a recovery schedule depicting how you intend to bring the project back to the approved project completion date. This recovery schedule is in addition to the update schedule.

State-owned float is considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. Prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action as specified in "Time Impact Analysis." The Engineer documents State-owned float by directing you to update the State-owned float activity on the next updated schedule. Include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present, or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date as specified in Section 4-1.03, "Changes," of the Standard Specifications. Prepare a time impact analysis to determine the effect of the change as specified in "Time Impact Analysis" and include the impacts acceptable to the Engineer in the next updated schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules does not waive any contract requirements and does not relieve you of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit them within 7 days of notification by the Engineer, at which time a new review period of 7 days will begin.

Errors or omissions on schedules do not relieve you from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either you or the Engineer discover that any aspect of the schedule has an error or omission, you must correct it on the next updated schedule.

Computer Equipment and Software

Submit to the Engineer for review a description of proposed schedule software and plotter to be used. After the Engineer accepts the proposed software, furnish schedule software and all original software instruction manuals. All software must be compatible with the current version of the Windows operating system in use by the Engineer. The schedule software must include the latest version of Oracle Primavera P6 Professional Project Management for Windows, or equivalent.

If a schedule software equivalent to P6 is proposed, it must be capable of:

1. Generating files that can be imported into P6
2. Comparing 2 schedules and providing reports of changes in activity ID, activity description, constraints, calendar assignments, durations, and logic ties

Provide a color-ink-jet plotter with a minimum 36 Megabytes RAM, capable of 300 dots per inch color, 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 914mm x 1219mm (E size) and is compatible with the selected system. HP Designjet T2300, equivalent or later. Contractor must provide all necessary maintenance, ink and supplies, and plotter paper for the printer throughout the duration of the project

The schedule software, schedule-comparing software and plotter will be returned to you before the final estimate. The Department will compensate you as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications for replacement of software or manuals damaged, lost, or stolen after delivery to the Engineer.

Instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 15 days of contract approval, provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that you also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If schedule software other than P6 is submitted, then the training session must be a total of 16-hours for each Department employee.

Network Diagrams, Reports, and Data

Include the following with each schedule submittal:

1. One sets of originally plotted, time-scaled network diagrams
2. Two copies of a narrative report
3. Two read-only compact disk or floppy diskette containing the schedule data

The time-scaled network diagrams must conform to the following:

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the primary paths of criticality using graphical presentation
4. Be prepared on 914mm x 1219mm
5. Include a title block and a timeline on each page

The narrative report must be organized in the following sequence with all applicable documents included:

1. Transmittal letter
2. Work completed during the period
3. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours
4. Description of the current critical path
5. Changes to the critical path and scheduled completion date since the last schedule submittal
6. Description of problem areas
7. Current and anticipated delays:

    7.1. Cause of delay
    7.2. Impact of delay on other activities, milestones, and completion dates
    7.3. Corrective action and schedule adjustments to correct the delay

8. Pending items and status thereof:

    8.1. Permits
    8.2. Change orders
    8.3. Time adjustments
    8.4. Noncompliance notices
    8.5. Notice of Potential Claims

9. Reasons for an early or late scheduled completion date in comparison to the contract completion date
10. Responses to previous schedule comments

Schedule submittals will only be considered complete when all documents and data have been submitted as described above.

Preconstruction Scheduling Conference

Schedule a preconstruction scheduling conference with your project manager and the Engineer within 15 days after contract approval. The Engineer will conduct the meeting and review the requirements of this section with you.

Submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and be prepared to discuss the proposed work plan and schedule methodology, all software scheduling variables and options that comply with the requirements of this section. If you propose deviations to the construction staging, then the general time-scaled logic diagram must also display the deviations and resulting time impacts. Be prepared to discuss the proposal.

At this meeting, also submit the alphanumeric coding structure and activity identification system for labeling work activities. The Engineer may submit a scheduling shell project displaying an activity code dictionary consisting of fields populated with the Department scheduling codes, filters, layouts, report formats and a resource dictionary to be incorporated into the schedule. To easily identify relationships, each activity description must indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor, or mainline.

The Engineer reviews the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to you for implementation.

Baseline Schedule

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss schedule development and resolve schedule issues until the baseline schedule is accepted.

Submit a baseline schedule within 6 weeks of contract approval. Allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal is not considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated. The baseline schedule must meet interim milestone dates, contract milestones dates, stage construction requirements, internal time constraints, and show logical sequence of activities. The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical, unless otherwise authorized.

The baseline schedule must not extend beyond the number of contract working days. The baseline schedule must have a data date of contract approval. If you start work before contract approval, the baseline schedule must have a data date of the 1st day you performed work at the job site.

The baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors. Use average composite crews to display the labor loading of on-site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms must show labor crafts and equipment classes to be used. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

Updated Schedule

Submit an updated schedule and meet with the Engineer to review contract progress, on or before the 1st day of each month, beginning one month after the baseline schedule is accepted. Allow 15 days for the Engineer's review after the updated schedule and all support data are submitted and the review meeting is held, except that the review period will not start until the previous month's required schedule is accepted. Updated schedules that are not accepted or rejected within the review period are considered accepted by the Engineer. Rejected schedules must be re-submitted within one week, at which time a new one week review time will begin.

The updated schedule must have a data date of the 21st day of the month or other date established by the Engineer. The updated schedule must show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete, and finish dates must be shown as applicable. Durations for work that has been completed must be shown on the updated schedule as the work actually occurred, including Engineer submittal review and your resubmittal times.

You may include modifications such as adding or deleting activities or changing activity constraints, durations, or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. Justify in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then submit a time impact analysis as specified in this section.

Weekly Schedule Progress Meetings

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss the near term scheduled activities, address any long term schedule issues, address the weekly controlling operation and to discuss any relevant technical issues.

Submit a rolling 4-week schedule identifying the previous week worked and a 3-week look ahead one day before the meeting. The Engineer will approve the 4-week schedule form and software. The 4-week rolling schedule must be at least as detailed as the latest accepted schedule and provide sufficient detail to include your actual and planned activities and those of your subcontractors for offsite and construction activities. Address all activities to be performed and identify issues requiring engineering input or action.

Each activity in the 4-week rolling schedule must be identified by an associated CPM schedule activity ID numbering system.

Time Impact Analysis

Submit a written time impact analysis (TIA) with each request for adjustment of contract time, or when you or the Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA must illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules must be equal to the adjustment of contract time. The Engineer may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until you provide the TIA.

Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path from the time of actual delay or from the time the contract change order work if performed. Mitigation measures must be included in the schedule analysis. The TIA must also consider the use of State Owned Float as a mitigation measure. Time extensions will not be granted nor will delay damages be paid unless:

1. The delay is beyond the control and without fault or negligence of the contractor and its subcontractors or suppliers of any tier; and
2. The delay extends the actual performance of the work beyond the current contract completion date.
3. The delay impacts a fabrication or construction activity – delays to the Contractors submittal or shop drawing process must impact a successor fabrication or construction activity.

Submit 2 copies of your TIA within 20 days of receiving a written request for a TIA from the Engineer. Allow the Engineer 15 days after receipt to review the submitted TIA. All approved TIA schedule changes must be shown on the next updated schedule.

If a TIA you submit is rejected, meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, you are allowed 5 days from the date you receive the Engineer's response to your protest to submit an Initial Potential Claim Record as specified in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. Only show actual as-built work, not unapproved changes related to the TIA, in subsequent updated schedules. If agreement is reached at a later date, approved TIA schedule changes must be shown on the next updated schedule. The Engineer withholds remaining payment on the schedule contract item if a TIA is requested and not submitted within 20 days. The schedule item payment resumes on the next estimate after the requested TIA is submitted. No other contract payment is withheld regarding TIA submittals.

Final Updated Schedule

Submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your project manager or an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, plotter, paper and plotter ink 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:

1. A total of 25 percent of the item amount will be paid upon achieving all of the following:

    1.1. Completion of 5 percent of all contract item work.
    1.2. Acceptance of all schedules and approval of all TIAs required to the time when 5 percent of all contract item work is complete.
    1.3. Delivery of schedule software to the Engineer.
    1.4. Completion of required schedule software training.

2. A total of 50 percent of the item amount will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 25 percent of all contract item work is complete.
3. A total of 75 percent of the item amount will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 50 percent of all contract item work is complete.
4. A total of 100 percent of the item amount will be paid upon completion of all contract item work, acceptance of all schedules and approval of all TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If you fail to complete any of the work or provide any of the schedules required by this section, the Engineer makes an adjustment in compensation as specified in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in submitting schedules.

10-1.20 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.

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 the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.06, "Partial Payments," 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 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.

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert	811

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 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 and these special provisions.

Closure is defined as the closure of a traffic lane or lanes, including shoulder, 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.

In addition to the provisions set forth in "Public Safety" of these special provisions, whenever work, including the work of installing, maintaining, and removing temporary railing (Type K) is to be performed on the freeway within 1.8 m of the adjacent traffic lane, the adjacent traffic lane shall be closed.

Except as listed above, closure of adjacent traffic lane will not be required for grinding and grooving operations, and for installing, maintaining and removing traffic control devices.

Work that interferes with public traffic shall be limited to the hours when lane closures are allowed, except for work required under Sections 7-1.08, "Public Convenience," and Section 7-1.09, "Public Safety."

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Special days are: the third Monday in January, February 12th, March 31st, the second Monday in October, and any day on which a major event is scheduled at Candlestick Park, AT&T Park, downtown San Francisco, Treasure Island, Oakland Coliseum, ORACLE Arena, or downtown Oakland.

The Contractor shall notify the Toll Collection Lieutenant of San Francisco-Oakland Bay Bridge at (510) 286-1148 of the Contractor's intent to begin work at least 7 business days before work begins. The Contractor shall cooperate with Toll Collection Lieutenant relative to handle traffic through the work area and shall make arrangements to keep the work area clear of parked vehicles.

The Contractor shall notify the Engineer and AC Transit of Oakland at (510) 891-4909 at least 21 business days prior to closing westbound Route 80 Bus lanes, between Route 880 touchdown and metering signals.

Attention is directed to "Bridge Tolls" of these special provisions. The access for the Contractor's trucks hauling material and surplus materials to and from the project site, from eastbound Route 80, westbound Route 80, and northbound Route 880 connector to westbound Route 80, shall not be allowed, during the peak periods from 5:00 a.m. to 10:00 a.m., and 3:00 p.m. to 7:00 p.m., on weekdays. Furthermore, the access for the Contractor's trucks hauling materials to the project site from westbound Route 80, through the bus and carpool lanes, at San Francisco-Oakland Bay Bridge toll plaza, shall not be allowed, during the peak periods from 5:00 a.m. to 10:00 a.m., and 3:00 p.m. to 7:00 p.m., on weekdays.

SC6-3(CA) (RAMP CLOSED) sign shall be used to inform motorists of the temporary closing of a connector, entrance ramp or exit ramp for 1 business day.

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 1 business day.

The SC6-3(CA) or SC6-4(CA) signs shall be installed at least 21 days before closing the connector or ramp, but not more than 28 days before the connector or ramp closure. The Contractor shall notify the Engineer at least 2 business days before installing the SC6-3(CA) or SC6-4(CA) signs.

Accurate information shall be maintained on the SC6-3(CA) or SC6-4(CA) signs. The SC6-3(CA) or SC6-4(CA) signs, when no longer required, shall be immediately covered or removed.

Freeways may be closed only if signed for closing 21 days in advance. The Contractor shall notify the Engineer not less than 5 business days prior to signing the freeway. If the freeway is not closed on the posted day, the closure shall be changed to allow a 14-business-day advance notice before closure.

Freeway closure charts are for the erection and removal of falsework, 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 within 1.8 m of a traffic lane to perform active construction, the shoulder area shall be closed as shown on the plans.

Existing Maintenance and Burma Road is the access for State forces, including public utilities, East Bay Municipal Utility District (EBMUD), Pacific Gas and Electric (PG&E), American Telephone & Telegraph (AT&T), and other private utility companies to the project site and their facilities.

The Contractor must provide and maintain a minimum of 3.6 m traffic lane in each direction, on existing Maintenance and Burma Road, as shown on the plans, at all times, except during the demolition of the existing Oakland Approach Structures , Br. No. 33-0025.

Full compensation for providing and maintaining the access shall be considered as included in the contract price paid for various items of work involved and no additional compensation will be allowed therefor.

The Contractor must provide and maintain a minimum of 3.6 m traffic lane for an emergency access, when ordered by the Engineer.

Full compensation for maintaining the access and providing emergency access shall be considered as included in the contract price paid for various items of work involved and no additional compensation will be allowed therefor.

The Contractor will not be allowed to use the existing maintenance overcrossing structure, which is the main entrance roadway to Caltrans maintenance yard from Burma Road.

If minor deviations from the lane requirement charts are required, a written request shall be submitted to the Engineer at least 28 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.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the C43(CA), SC6-3(CA), SC6-4(CA), W20-1, W21-5b, and C24(CA) 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 and Special Days

Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun
x	**H** xx	xx	xx							
	SD xx									
x	xx	**H** xx	xx							
		SD xx								
	x	xx	**H** xx	xx						
			SD xx							
	x	xx	xx	**H** xx						
	x	xx	xx	**SD** xx						
				x	**H** xx					
				x	**SD** xx					
					x	**H** xx				
						SD xx				
						x	**H** xx	xx		xx
							SD xx			

Legends:

	Refer to lane closure charts
x	The full width of the traveled way shall be open for use by public traffic after 4:30 a.m.
xx	The full width of the traveled way shall be open for use by public traffic.
H	Designated Legal Holiday
SD	Special Day

Chart No. 1
Freeway/Expressway Lane Requirements

County: San Francisco/Alameda	Route/Direction: 80 Eastbound	KP: 12.7 to 14.4/0.0 to 3.2

Closure Limits: Between Treasure Island and left off-ramp (KP 12.4) and SFOBB Toll Plaza

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	1	1	1	2	4																		3
Fridays	3	2	2	1	1	2	4																		
Saturdays	4	4	3	3	1	2	2	3	3																
Sundays	4	3	3	2	1	1	2	2	3	4													4	3	

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
4	Provide at least four adjacent through freeway lanes open in direction of travel
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 2
Freeway/Expressway Lane Requirements

County: San Francisco/Alameda	Route/Direction: 80 Westbound	KP: 12.7 to 14.4/0.0 to 2.0

Closure Limits: Between Treasure Island on-ramp (KP 12.3) and east end of SFOBB

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	1	1	1	2																4	4	4	3	
Fridays	2	1	1	1	2																	4	4	3	
Saturdays	2	2	1	1	1	2	3	4																4	
Sundays	2	2	1	1	1	2	2	3	3													4	4	3	

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
4	Provide at least four adjacent through freeway lanes open in direction of travel
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

1. All lane closures shall be coordinated in advance with the Toll Collection Lieutenant at the San Francisco/Oakland Bay Bridge.

Chart No. 3
Freeway/Expressway Lane Requirements

County: Alameda	Route/Direction: 80 Westbound	KP: 3.2

Closure Limits: At the SFOBB Toll Plaza

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	11	9	5	6	9																	16	14	12	
Fridays	11	9	5	6	9																	16	14	12	
Saturdays	11	9	5	6	9	12	15	17																12	
Sundays	11	9	5	6	9	10	12	17																12	

Legend:

#	Number of toll booths that shall be open to traffic
	No toll booth closure allowed

REMARKS:

1. All lane closures required for toll booth closures shall be coordinated in advance with the Toll Collection Lieutenant at the San Francisco/Oakland Bay Bridge.

Chart No. 4
Freeway/Expressway Lane Requirements

County: San Francisco/ Alameda	Route/Direction: 80 Eastbound	KP: 12.4/14.4 /0.0 to 3.2

Closure Limits: Shoulder – Between the Yerba Buena Island on-ramp and the SFOBB Toll Plaza

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	S	S	S	S	S	S	S																		S
Fridays	S	S	S	S	S	S	S																		
Saturdays	S	S	S	S	S	S	S	S	S																
Sundays	S	S	S	S	S	S	S	S	S	S													S	S	

Legend:

S	Shoulder closure permitted
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 5
Freeway/Expressway Lane Requirements

County: San Francisco/ Alameda	Route/Direction: 80 Westbound	KP: 12.4 to 14.4/0.0 to 2.7

Closure Limits: Shoulder – Between the Yerba Buena Island on-ramp and the SFOBB metering signals

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	S	S	S	S	S																S	S	S	S	
Fridays	S	S	S	S	S																	S	S	S	
Saturdays	S	S	S	S	S	S	S	S																S	
Sundays	S	S	S	S	S	S	S	S	S													S	S	S	

Legend:

S	Shoulder closure permitted
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 6
Freeway/Expressway Lane Requirements

County: Alameda	Route/Direction: 80 Westbound	KP: 2.0/3.2

Closure Limits: Between the east end of SFOBB and Metering Signals

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	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																	X	X	X	
Saturdays	X	X	X	X	X	X	X	X																X	
Sundays	X	X	X	X	X	X	X	X	X													X	X	X	

Legend:

X	All lanes that merge into any open lanes on the SFOBB shall remain open to traffic.
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

1. All lane closures shall be coordinated in advance with the Toll Collection Lieutenant at the San Francisco/Oakland Bay Bridge.

Chart No. 7
72-Hour Full Closure - Freeway/Expressway Lane Requirements

County: San Francisco/Alameda	Route/Direction: 80 Eastbound	KP: 8.6 to 14.4/0.0 to 3.2

Closure Limits: San Francisco - Oakland Bay Bridge and its approaches

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
Monday	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C					
Friday																					C	C	C	C	
Saturday	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Sunday	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	All lanes may be closed.
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

1. One time full bridge closure is allowed between Friday night at 8:00 p.m. and Monday night at 8:00 p.m., and must occur simultaneously with the start of the closure shown on Chart No. 8.

Chart No. 8
72-Hour Full Closure - Freeway/Expressway Lane Requirements

County: San Francisco/Alameda	Route/Direction: 80 Westbound	KP: 8.6 to 14.4/0.0 to 3.2

Closure Limits: San Francisco - Oakland Bay Bridge and its approaches

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
Monday	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C					
Friday																					C	C	C	C	
Saturday	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Sunday	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	All lanes may be closed.
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

1. One time full closure is allowed between Friday night at 8:00p.m. and Monday night at 8:00p.m. and must occur simultaneously with the start of the closure shown on Chart No. 7.

Chart No. 9
Complete Ramp Closure Hours/Ramp Lane Requirements

County: Alameda	Route/Direction: 80 Westbound	KP: 3.1/3.3

Closure Limits: Bus lanes between Route 880 touchdown and Metering Signals

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						1	1	1	1	1					1	1	1	1	2	
Fridays	2	2	2	2	2						1	1	1	1	1					1	1	1	1	2	
Saturdays	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Sundays	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	

Legend:

1	Provide at least one ramp lane, not less than 3.3 m in width, open in direction of travel
2	Two traffic lanes may be closed.
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No.10
Complete Ramp Closure Hours/Ramp Lane Requirements

County: San Francisco	Route/Direction: 80 Eastbound	KP: 7.1/12.6

Closure Limits: Simultaneous closure of the Yerba Buena Island on-ramp, Eighth/Bryant Street on-ramp, Fifth Street on-ramp, Essex Street on-ramp, First street on-ramp, and Sterling street on-ramp.

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					
Fridays																					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	
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	

Legend:

C	Ramp may be closed completely
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

1. This ramp/connector closure chart shall be implemented with EB-80 full bridge closure only (See Chart No. 7).

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 falsework over any one opening before 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.

The Engineer will have the authority to disapprove any closure schedule request, deny or abort any closure on any portion of the traveled way, when deemed necessary for the safe and efficient operation of public traffic or when necessary to resolve conflicts in closure schedules' among Contractors or other State forces performing work within the State right of way.

CLOSURE SCHEDULE

A written schedule of planned closures for the next week period, defined as Sunday noon through the following Sunday noon, shall be submitted by noon each Monday. A written schedule shall be submitted not less than 25 days and not more than 125 days before the anticipated start of any operation that will:

1. Reduce horizontal clearances, traveled way, including shoulders, to two lanes or less due to such operations as temporary barrier placement and paving
2. Reduce the vertical clearances available to the public due to such operations as pavement overlay, overhead sign installation, or falsework or girder erection

The Closure Schedule shall show the locations and times of the proposed closures. The Closure Schedule request forms furnished by the Engineer shall be used. Closure Schedules submitted to the Engineer with incomplete or inaccurate information will be rejected and returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Closure Schedule amendments, including adding additional closures, shall be submitted by noon to the Engineer, in writing, at least 3 business days in advance of a planned closure. Approval of Closure Schedule amendments will be at the discretion of the Engineer.

The Engineer shall be notified of cancelled closures 2 business days before the date of closure.

Closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer.

CONTINGENCY PLAN

A detailed contingency plan shall be prepared for reopening closures to public traffic. If required by "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, the contingency plan shall be submitted to the Engineer before work at the job site begins. Otherwise, the contingency plan shall be submitted to the Engineer within one business day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. No further closures are to be made until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 business days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct the amount per interval shown below from moneys due or that may become due the Contractor under the contract. Damages are limited to 5 percent of project cost per occurrence and will not be assessed when the Engineer requests that the closure remain in place beyond the scheduled pickup time.

Type of Facility	Route or Segment	Period	Damages/interval ($)
Mainline	Route 80	1st half hour 2nd half hour 2nd hour and beyond	$4,300.00 / 10 minutes $6,400.00 / 10 minutes $8,500.00 / 10 minutes
Mainline	Route 80 (Full Closure)	1st half hour 2nd half hour 2nd hour and beyond	$10,000.00 / 10 minutes $15,000.00 / 10 minutes $20,000.00 / 10 minutes

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 IMPACT ATTENUATOR VEHICLE

GENERAL

Summary

Work includes protecting traffic and workers by using impact attenuator vehicle as a shadow vehicle when placing and removing components of a traffic control system, and when performing a moving lane closure.

Comply with Section 12-3.03, "Flashing Arrow Signs," of the Standard Specifications.

Impact attenuator vehicle must comply with the following test levels under National Cooperative Highway Research Program 350:

1. Test level 3 for pre-construction posted speed limit of 80 km/hr or more
2. Test levels 2 or 3 for pre-construction posted speed limit of 70 km/hr or less

Comply with the attenuator manufacturer's recommendations for:

1. Support truck
2. Trailer-mounted operation
3. Truck-mounted operation

Definitions

impact attenuator vehicle: Support truck towing a deployed attenuator mounted to a trailer or support truck with a deployed attenuator mounted to the support truck.

Submittals

Upon request, submit a Certificate of Compliance for attenuator to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

Attenuator must be a brand listed on the Department's pre-approved list at:
http://www.dot.ca.gov/hq/esc/approved_products_list/HighwaySafe.htm

MATERIALS

The combined mass of the support truck and the attenuator must be at least 9000 kg, except the mass of the support truck must not be less than 7300 kg or greater than 12000 kg.

If using the Trinity MPS-350 truck-mounted attenuator, the support truck must not have any underneath fuel tank mounted within 3.2 m of the rear of the support truck.

Each impact attenuator vehicle must:

1. Have standard brake lights, taillights, sidelights, and turn signals
2. Have an inverted "V" chevron pattern placed across the entire rear of the attenuator composed of alternating 100 mm wide non-reflective black stripes and 100 mm wide yellow retroreflective stripes sloping at 45 degrees
3. Have a Type II flashing arrow sign
4. Have a flashing or rotating amber light
5. Have an operable 2-way communication system for maintaining contact with workers

CONSTRUCTION

Use impact attenuator vehicle to follow behind equipment and workers who are placing and removing components of a traffic control system for a lane closure or a ramp closure. Flashing arrow sign must be operating in arrow mode during this activity. Follow at a distance to prevent intrusion into the workspace from passing traffic.

After placing components of a traffic control system for a lane closure or a ramp closure you may use impact attenuator vehicle in a closed lane and in advance of a work area to protect traffic and workers.

Use impact attenuator vehicle as a shadow vehicle under traffic control for a moving lane closure.

Secure objects including equipment, tools and ballast on impact attenuator vehicle to prevent loosening upon impact by an errant vehicle.

Do not use a damaged attenuator in the work. Replace, at your expense, an attenuator damaged from an impact during work.

MEASUREMENT AND PAYMENT

Full compensation for furnishing and operating impact attenuator vehicle is included in the contract lump sum price paid for traffic control system, and no additional compensation will be allowed therefor.

10-1.26 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.

The traffic cones shown to be placed transversely across closed traffic lanes and shoulders on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be placed.

MOVING LANE CLOSURE

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 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. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be _____ mm ± _____ mm above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

PAYMENT

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.27 TEMPORARY PAVEMENT DELINEATION

Except on Maintenance Road, temporary pavement delineation on WB-80 between Station W 91+00 and W 96+10 shall be paint (1-coat), and shall be used on or adjacent to lanes open to public traffic for a maximum of 14 days. Before the end of the 14 days, the permanent pavement delineation shall be placed.

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.

Work necessary, including required lines or markers, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. 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 delineation and temporary pavement markers that conflict with a new traffic pattern or that are applied to the final layer of surfacing or existing pavement to remain in place shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Temporary pavement delineation shall be used on or adjacent to lanes open to public traffic for a maximum of 14 days. 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, additional temporary pavement delineation shall be provided by the Contractor at no additional cost to the Department. 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.

Painted traffic stripe used for temporary delineation shall conform to "Paint Traffic Stripe and Pavement Marking" of these special provisions, except for payment. The quantity of painted traffic stripe used for temporary delineation will not be included in the quantities of paint traffic stripe to be paid for.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

When lanelines or centerlines are obliterated, the minimum laneline and centerline delineation to be provided 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 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 (6 months or less) 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 to place pavement markers in areas where removal of the markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers shall be placed on longitudinal intervals of not more than 7.3 m.

Full compensation for furnishing, placing, maintaining, and removing temporary pavement markers used for temporary laneline and centerline delineation and for providing equivalent patterns of permanent traffic lines for these 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, and maintaining temporary painted laneline and centerline pavement delineation 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.

TEMPORARY EDGELINE DELINEATION

When edgelines are obliterated on multilane roadways (freeways and expressways), the edgeline delineation to be provided for that area adjacent to lanes open to public traffic shall consist of, solid 100-mm wide traffic stripe paint (1-coat) of the same color as the stripe it replaces.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation 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.

10-1.28 TEMPORARY PAVEMENT DELINEATION (EB-80)

Temporary pavement delineation on EB-80 between Station E 86+20 and E 90+20 shall conform to the pavement delineation details as shown on the plans, and shall be used on or adjacent to lanes open to public traffic for long term day/night use (180 days or less). A paint (1-coat) shall be used for temporary traffic stripe as shown on the plans.

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 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.

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 hot mix asphalt surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

MEASUREMENT AND PAYMENT

Temporary traffic stripe and temporary pavement marking shown on the plans will be measured and paid for in the same manner specified for paint traffic stripe and paint pavement marking in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Temporary pavement markers shown on the plans will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and 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 no separate payment will be made therefor.

Full compensation for removing the temporary traffic stripe (paint) when no longer required (including layout (dribble) lines to establish alignment used for temporary laneline) 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 no separate payment will be made therefor.

10-1.29 PORTABLE CHANGEABLE MESSAGE SIGNS

GENERAL

Summary

Work includes furnishing, placing, operating, maintaining, and removing portable changeable message signs.

Comply with Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications and "Maintaining Traffic" of these special provisions.

Definitions

useable shoulder area: Paved or unpaved contiguous surface adjacent to the traveled way with:

1. Sufficient weight bearing capacity to support portable changeable message sign
2. Slope not greater than 6:1 (horizontal:vertical)

Submittals

Upon request, submit a Certificate of Compliance for each portable changeable message sign under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

Comply with the manufacturer's operating instructions for portable changeable message sign.

Approaching drivers must be able to read the entire message for all phases at least twice at the posted speed limit before passing portable changeable message sign. You may use more than one portable changeable message sign to meet this requirement.

Only display the message shown on the plans or ordered by the Engineer or specified in these special provisions.

MATERIALS

Portable changeable message sign must have 24-hour timer control or remote control capability.

The text of the message displayed on portable changeable message sign must not scroll, or travel horizontally or vertically across the face of the message panel.

CONSTRUCTION

Continuously repeat the entire message in no more than 2 phases of at least 3 seconds per phase.

If useable shoulder area is at least 4.6 m wide, the displayed message on portable changeable message sign must be minimum 450 mm character height. If useable shoulder area is less than 4.6 m wide, you may use a smaller message panel with minimum 300 mm character height to prevent encroachment in the traveled way.

The Contractor's personnel responsible for the maintenance and operation of the portable changeable message signs must be on the project site, and must be available by cell phone. The Contractor must provide the Engineer with the contact cell phone number of the responsible Contractor's personnel who maintains and operates the portable changeable message signs.

During operations that require portable changeable message signs, the Contractor must provide 24-hour-a-day availability of equipment and personnel to modify messages displayed, and to maintain and promptly repair or replace inoperable portable changeable message signs.

The Contractor must complete the display of modified message on the portable changeable message signs in operation within 10 minutes after receiving the Engineer's order.

The Contractor must repair or replace defective or damaged portable changeable message sign(s) within 15 minutes after receiving the Engineer's order.

Start displaying the message on portable changeable message sign 40 minutes before closing the lane.

Start displaying the message on portable changeable message signs 3 weeks before closing the San Francisco-Oakland Bay Bridge on Route 80.

The Contractor must cooperate with the State Forces in coordinating the message displayed on portable changeable message signs and changeable message signs. Full compensation for coordinating the message displayed on portable changeable message signs and changeable message signs for the full closure is included in the contract lump sum price paid for portable changeable message signs, and no separate payment will be made therefor.

The Department will display the message on changeable message signs as shown on the plans 3 weeks before closing the full closure of the San Francisco-Oakland Bay Bridge on Route 80.

Except PCMS shown on the plans, for the full San Francisco-Oakland Bay Bridge (Route 80) closure, place the required portable changeable message signs in advance of the first warning sign for the following operations:

1. Each stationary lane closure
2. Each off-ramp closure
3. Each connector closure
4. Each shoulder closure
5. Each speed reduction zone

Place portable changeable message sign as far from the traveled way as practicable where it is legible to traffic and does not encroach on the traveled way. Place portable changeable sign before or at the crest of vertical roadway curvature where it is visible to approaching traffic. Avoid placing portable changeable message sign within or immediately after horizontal roadway curvature. Where possible, place portable changeable message sign behind guardrail or temporary railing (Type K).

Except where placed behind guardrail or temporary railing (Type K) use traffic control for shoulder closure to delineate portable changeable message sign.

Remove portable changeable message sign when not in use.

MEASUREMENT AND PAYMENT

Full compensation for portable changeable message signs (PCMS) (except for PCMS for the San Francisco-Oakland Bay Bridge full closure) including furnishing, placing, operating, modifying messages, maintaining, transporting from location to location, removing, and repairing or replacing defective or damaged portable changeable message signs is included in the contract lump sum price paid for traffic control system and no separate payment will be made therefor.

The contract lump sum price paid for portable changeable message signs for the San Francisco-Oakland Bay Bridge full closure includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, operating, modifying messages, maintaining portable changeable message signs, complete in place, including transporting from location to location, removing, and repairing or replacing defective or damaged portable changeable message signs**,** as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Portable changeable message signs ordered by the Engineer in excess of the number shown on the plans or specified in these special provisions will be paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.30 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.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" 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.

10-1.31 CHANNELIZER

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

When no longer required for the work as determined by the Engineer, channelizers and underlying adhesive used to cement the channelizer bases to the pavement shall be removed. Removed channelizers and adhesive shall become the property of the Contractor and shall be removed from the site of work.

10-1.32 TEMPORARY TRAFFIC SCREEN

Temporary traffic screen shall be furnished, installed, and maintained on top of temporary railing (Type K) at the locations designated on the plans, specified in the special provisions or directed by the Engineer and shall conform to the provisions specified for traffic handling equipment and devices in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Temporary traffic screen panels shall be new or used CDX Grade, or better, plywood or weather resistant strandboard mounted and anchored on temporary railing (Type K). Wale boards shall be new or used Douglas fir, rough sawn, Construction Grade, or better. Pipe screen supports shall be new or used galvanized steel pipe, Schedule 40. Nuts, bolts, and washers shall be cadmium plated. Screws shall be black or cadmium plated flat head, cross slotted screws with full thread length.

When no longer required, as determined by the Engineer, temporary traffic screen shall be removed from the site of the work and shall become the property of the Contractor.

Temporary traffic screen will be measured by the meter from actual measurements along the line of the completed temporary traffic screen, at each location designated on the plans, specified or directed by the Engineer. If the Engineer orders a lateral move of temporary railing, with temporary traffic screen attached, and the repositioning is not shown on the plans, moving the temporary traffic screen will be paid for as part of the extra work for moving the temporary railing as specified in Section 12-4.01, "Measurement and Payment," of the Standard Specifications. Temporary traffic screen placed in excess of the length shown, specified or directed by the Engineer will not be paid for.

The contract price paid per meter for temporary traffic screen shall include full compensation for furnishing all labor, materials (including anchoring systems), tools, equipment, and incidentals, and for doing all the work involved in installing, maintaining, and removing the temporary traffic screen, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

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.

EXISTING PAINT SYSTEMS

The existing paint systems on Bridge Number 33-25 consist of lead, chromium, and zinc. Any work that disturbs the existing paint system will expose workers to health hazards and will (1) produce debris containing heavy metal in amounts that exceed the thresholds established in Titles 8 and 22 of the California Code of Regulations or (2) produce toxic fumes when heated. All debris produced when the existing paint system is disturbed shall be contained.

Debris Containment and Collection Program

Prior to starting work, the Contractor shall submit a debris containment and collection program to the Engineer in conformance with the provisions in "Working Drawings" of these special provisions, for debris produced when the existing paint system is disturbed. The program shall identify materials, equipment, and methods to be used when the existing paint system is disturbed and shall include working drawings of containment systems, loads applied to the bridge by containment structures, and provisions for ventilation and air movement for visibility and worker safety.

If the measures being taken by the Contractor are inadequate to provide for the containment and collection of debris produced when the existing paint system is disturbed, the Engineer will direct the Contractor to revise the operations and the debris containment and collection program. The directions will be in writing and will specify the items of work for which the Contractor's debris containment and collection program is inadequate. No further work shall be performed on the items until the debris containment and collection program is adequate and, if required, a revised program has been approved for the containment and collection of debris produced when the existing paint system is disturbed.

The Engineer will notify the Contractor of the approval or rejection of the submitted or revised debris containment and collection program within 2 weeks of submittal of the Contractor's program or revised program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised debris containment and collection program, nor for delays to the work due to the Contractor's failure to submit an acceptable program.

Full compensation for the debris containment and collection program shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

Safety and Health 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 Code of Regulations, Title 8, Construction Safety Orders, including Section 1532.1, "Lead."

The Contractor shall furnish the Engineer a written Code of Safe Practices and shall implement an Injury and Illness Prevention Program and a Hazard Communication Program in conformance with the requirements of Construction Safety Orders, Sections 1509 and 1510.

Prior to starting work that disturbs the existing paint system, and when revisions to the program are required by Section 1532.1, "Lead," the Contractor shall submit the compliance programs required in subsection (e)(2), "Compliance Program," of Section 1532.1, "Lead," of the Construction Safety Orders to the Engineer in conformance with the provisions in "Working Drawings" of these special provisions. The compliance programs shall include the data specified in subsections (e)(2)(B) and (e)(2)(C) of Section 1532.1, "Lead." Approval of the compliance programs by the Engineer will not be required. The compliance programs shall be reviewed and signed by a Certified Industrial Hygienist (CIH) who is certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH). Copies of all air monitoring or jobsite inspection reports made by or under the direction of the CIH in conformance with Section 1532.1, "Lead," shall be furnished to the Engineer within 10 days after the date of monitoring or inspection.

Full compensation for furnishing the Engineer with the submittals and for implementing the programs required by this safety and health section shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

Debris Handling

Debris produced when the existing paint system is disturbed shall not be temporarily stored on the ground. Debris accumulated inside the containment system shall be removed before the end of each work shift. Debris shall be stored in approved, leakproof containers and shall be handled in such a manner that no spillage will occur.

Disposal of debris produced when the existing paint system is disturbed shall be performed in conformance with all applicable Federal, State, and Local hazardous waste laws. Laws that govern this work include:

A. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act).
B. Title 22; California Code of Regulations, Division 4.5, (Environmental Health Standards for the Management of Hazardous Waste).
C. Title 8, California Code of Regulations.

Except as otherwise provided herein, debris produced when the existing paint system is disturbed shall be disposed of by the Contractor at an approved Class 1 disposal facility in conformance with the requirements of the disposal facility operator. The debris shall be hauled by a transporter currently registered with the California Department of Toxic Substances Control using correct manifesting procedures and vehicles displaying current certification of compliance. The Contractor shall make all arrangements with the operator of the disposal facility and perform any testing of the debris required by the operator.

At the option of the Contractor, the debris produced when the existing paint system is disturbed may be disposed of by the Contractor at a facility equipped to recycle the debris, subject to the following requirements:

A. Copper slag abrasive blended by the supplier with a calcium silicate compound shall be used for blast cleaning.
B. The debris produced when the existing paint system is disturbed shall be tested by the Contractor to confirm that the solubility of the heavy metals is below regulatory limits and that the debris may be transported to the recycling facility as a non-hazardous waste.
C. The Contractor shall make all arrangements with the operator of the recycling facility and perform any testing of the debris produced when the existing paint system is disturbed that is required by the operator.

Full compensation for debris handling and disposal shall be considered as included in the contract price paid for the item of work causing the existing paint system to be disturbed, and no additional compensation will be allowed therefor.

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 commercial quality concrete containing not less than 300 kg of cement per cubic meter.

Abandoning culverts in place shall conform to the following:

A. 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.
B. 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.
C. 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 or pipeline 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.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill (including sand, controlled low strength material or slurry cement backfill) shall be considered as included in the contract unit price paid for abandon culvert and no additional compensation will be allowed therefor.

ABANDON INLET

Existing 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.

Removed frames and grates shall be disposed of.

SALVAGE QUICK KURB CHANNELIZER SYSTEM

Existing quick kurb channelizer system, where shown on the plans to be salvaged, shall be removed and salvaged.

Holes caused by the removal of anchor bolts must be backfilled with epoxy, before the traveled way and shoulder are open to traffic.

Salvaged quick kurb channelizer system shall be hauled to Caltrans Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, Telephone (415) 330-6500 and stockpiled.

Full compensation for backfilling the holes with epoxy shall be considered as included in the contract price paid per meter for salvage quick kurb channelizer system and no additional compensation will be allowed therefor.

REMOVE METAL BEAM GUARD RAILING

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

The Contractor shall obtain a written approval from the Engineer at least 5 working days before the Contractor intends to remove the existing metal beam guard railing.

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 no separate payment will be made therefor.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes, and the channel steel for the post bracing shall be considered as included in the contract price paid per meter for remove metal beam guard railing 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.

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 one meter below the adjacent finished grade. The resulting holes shall be backfilled and compacted with material equivalent to the surrounding material.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Electrical equipment, where shown on the plans, shall be salvaged.

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

Full compensation for removing and disposing of pavement markers and underlying adhesive shall be considered as included in the contract price paid for the various items of work involved and no separate payment will be made therefor.

REMOVE CRASH CUSHION (SAND FILLED)

Existing crash cushion (sand filled), where shown on the plans to be removed, shall be removed and disposed of.

The Contractor shall obtain a written approval from the Engineer at least 5 working days before the Contractor intends to remove the existing crash cushion (sand filled).

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

Remove crash cushion (sand filled) will be measured and paid for by the unit from actual count of crash cushion (sand filled) removed, regardless of the number of modules in each unit.

Full compensation for removal and disposal of sand shall be considered as included in the contract unit price paid for remove crash cushion (sand filled) and no additional compensation will be allowed therefor.

REMOVE DRAINAGE FACILITY

Existing culvert, and inlet where shown on the plans to be removed, shall be completely removed and disposed of.

REMOVE ASBESTOS CEMENT PIPE

Existing asbestos cement pipe, where shown on the plans to be removed, shall be removed and disposed of, and must be in compliance with the requirements in "Health and Safety Plan," and "Sampling and Removal of Asbestos-Containing Material," of these special provisions.

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.

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.

REMOVE PORTLAND CEMENT CONCRETE PAVEMENT

Removing portland cement concrete pavement shall conform to the provisions in Section 15-3, "Removing Concrete," of the Standard Specifications.

Where no joint exists in the pavement on the line at which concrete is to be removed, a straight, neat cut with a power driven saw shall be made along the line to a minimum depth of 50 mm before removing the concrete.

The quantities of portland cement concrete pavement removed will be measured and paid for by the cubic meter.

No deduction will be made from any excavation quantities for the quantity of portland cement concrete pavement removed.

Full compensation for removing bituminous or other overlying material and sawing joints at removal lines, as required, shall be considered as included in the contract price paid per cubic meter for remove concrete pavement and no additional compensation will be allowed therefor.

REMOVE BASE AND SURFACING

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed at least to a depth below the grade of the existing surfacing, as shown on the plans. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing base and surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove base and surfacing.

COLD PLANE ASPHALT CONCRETE PAVEMENT

GENERAL

Summary

This work includes cold planing existing asphalt concrete pavement.

Sequencing and Scheduling

Schedule cold planing activities to ensure hot mix asphalt (HMA) is placed over cold planed area during the same work shift before opening to traffic. If you cannot place HMA over the entire cold planed area before opening it to traffic:

1. Construct a temporary HMA taper to the level of the existing pavement.
2. Place HMA during the next lane or shoulder closure for that area.
3. Submit a corrective action plan that shows that you are able to cold plane and place HMA in the same work shift. Do not perform cold planing work until the Engineer approves the corrective action plan.

MATERIALS

HMA for temporary tapers must be of the same quality as the HMA used elsewhere on the project or comply with "Minor Hot Mix Asphalt" of these special provisions.

CONSTRUCTION

General

Perform planing of asphalt concrete pavement without the use of a heating device to soften the pavement.

Cold Planing Equipment

Cold planing machine must be:

1. Equipped with a cutter head width that matches the planing width. If the only available cutter head width is wider than the cold plane area shown, submit to the Engineer a request for using a wider cutter head. Do not cold plane until the Engineer approves your request.
2. Equipped with automatic controls to control the longitudinal grade and transverse slope of the cutter head and:

    2.1. If a ski device is used, it must be at least 750 mm long, rigid, and 1 piece unit. The entire length must be used in activating the sensor.
    2.2. If referencing from existing pavement, the cold planing machine must be controlled by a self-contained grade reference system. The system must be used at or near the centerline of the roadway. On the adjacent pass with the cold planing machine, a joint matching shoe may be used.

3. Equipped to effectively control dust generated by the planing operation.
4. Operated so that no fumes or smoke is produced.

Replace broken, missing, or worn machine teeth.

Grade Control and Surface Smoothness

Furnish, install, and maintain grade and transverse slope references.

The depth, length, width, and shape of the cut must be as shown or as ordered. The final cut must result in a neat and uniform surface. Do not damage remaining surface.

The completed surface of the planed asphalt concrete pavement must not vary more than 6 mm when measured with a 3.6 m straightedge parallel with the centerline. The transverse slope of the planed surface must not vary more than 9 mm from the straightedge when placed at right angles to the centerline.

A drop-off of more than 45 mm is not allowed between adjacent lanes open to public traffic.

Temporary HMA Tapers

If a drop-off between the existing pavement and the planed area at transverse joints cannot be avoided before opening to traffic, construct a temporary HMA taper. HMA for temporary taper must be:

1. Placed to the level of the existing pavement and tapered on a slope of 30:1 (Horizontal: Vertical) or flatter to the level of the planed area
2. Compacted by any method that will produce a smooth riding surface
3. Completely removed before placing the permanent surfacing. The removed material must be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Disposal of Planed Material

Remove cold planed material concurrent with planing activities, within 15 m of the planer or as ordered.

Dispose of planed material and under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Cold plane asphalt concrete pavement is measured by the square meter .

The contract price paid square meter for cold plane asphalt concrete pavement includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including constructing, maintaining, removing temporary HMA tapers if applicable, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for removal of thermoplastic traffic stripe, painted traffic stripe, and pavement marking in areas of cold plane asphalt concrete is included in the contract price paid for cold plane asphalt concrete and no separate payment will be made therefor.

CAP INLET

Existing pipe inlets 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.

Portland cement concrete shall be minor concrete or may be produced from commercial quality aggregates and cement containing not less than 350 kg of cement per cubic meter.

Inlets 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 will be determined as units from actual count.

The contract unit price paid for cap inlet shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in capping inlets, 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.

RECONSTRUCT ROCK SLOPE PROTECTION

LOCATION 1

Attention is directed to "Remove Bridge (Portion)," of these special provisions, regarding the removal of the temporary Bent 19AR.

Existing rock slope protection at temporary Bent 19AR shall be stockpiled and reconstructed after the completion of temporary Bent 19AR removal, and shall conform to the details shown on the plans and these special provisions.

PAYMENT

Full compensation for reconstruct rock slope protection shall be considered as included in the contract lump sum price paid for bridge removal (portion), Location B, and no separate payment will be made therefor.

LOCATION 2

The work shall consist of removing, stockpiling and reconstructing rock slope protection (1T, Method B), in accordance with the detail shown on the plans and in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications, and these special provisions.

Rock slope protection fabric shall be Geotextile Filter Fabric (nonwoven), and shall conform to "Geotextile Filter Fabric," of these special provisions.

MATERIALS

The rock slope materials shall be free from vegetable matter and other unsuitable material as determined by the Engineer.

MEASUREMENT AND PAYMENT

Reconstruct rock slope protection will be measured by cubic meter as designated in the Engineer's Estimate.

Quantity of rock slope protection to be paid by cubic meter will determined from the dimensions shown on the plans or the dimensions directed by the Engineer and rock protection placed in excess of these dimensions will not be paid for.

The contract price paid per cubic meter for reconstruct rock slope protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the rock slope protection, complete in place, including excavation for the placement of rock slope protection, and removing and stockpiling the existing rock slope protection, 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.

Attention is directed to "Order of Work," "Permits Licenses, Agreements, and Certifications," "Bird Protection," "Sampling and Removal of Asbestos-Containing Material," "Handling, Transportation, and Disposal of Contaminated Material," and "Existing Paint System," of these special provisions.

Bridge Removal (Portion), Location A

Remove portions of the existing San Francisco Oakland Bay Bridge (Br. No. 33-25) consisting of reinforced concrete T-beam superstructure, reinforced concrete end diaphragms, concrete barriers, metal railings and precast prestressed approach slabs, as shown on the plans.

Bridge Removal (Portion), Location B

Remove Eastbound Temporary Bent E19AR, including bearing pads, reinforced concrete pile cap with five cast-in-steel-shell piles, as shown on the plans, when no longer required as determined by the Engineer.

Bridge Removal (Portion), Location C

Remove Acrow Bridge consisting of a single span steel truss and metal ramps, as shown on the plans, when no longer required as determined by the Engineer.

The Contractor must provide at all times access to the Acrow bridge for use of the Engineer and other Contractors until it is removed. The Acrow Bridge must not be removed until access for the Engineer and other Contractors is provided through the new eastbound and westbound roadways and approach structures of the San Francisco Oakland Bay Bridge (Bridges No. 34-006 L/R). The Contractor must notify the Engineer in writing 14 days prior to removal of the Acrow Bridge.

Bridge Removal (Portion), Location D

Remove existing cable railing installed on the permanent barriers on Skyway Structure and Oakland Approach Structures of the San Francisco Oakland Bay Bridge (Bridge No. 34-0006) as shown on the plans when no longer required as determined by the Engineer.

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.

Holes in the concrete caused by the removal of cable railing and Acrow Bridge shall be backfilled with grout to match the existing top surfaces.

Existing epoxy coated barrier reinforcement bent to enable the Acrow Bridge placement shall be straightened and repaired prior to constructing the concrete barrier in conformance with the requirements of section "Concrete Barriers" of these special provisions .

Full compensation for backfilling holes caused by the removal of cable railing and Acrow Bridge shall be considered as included in the contract lump sum prices paid for bridge removal (portion) at the removal location involved and no additional compensation will be made therefor.

The Contractor shall submit a complete bridge removal plan to the Engineer for each location 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.

Temporary support shoring, temporary bracing, and protective covers, as required, shall be designed and constructed in conformance with the provisions in Section 51-1.06, "Falsework," of the Standard Specifications and these special provisions.

The assumed horizontal load to be resisted by the temporary support shoring and temporary bracing, for removal operations only, shall be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and an allowance for wind, but in no case shall the assumed horizontal load to be resisted in any direction be less than 5 percent of the total dead load of the structure to be removed.

The bridge removal plan shall conform to the provisions in "Working Drawings" of these special provisions. 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.

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.

CLEAN BRIDGE DECK

This work includes abrasive blast cleaning the portland cement concrete bridge deck.

Construction

Abrasive blast clean the deck surface. Sweep the deck surface clean. Blow loose material from cracks using high-pressure air.

The deck surface must be dry when abrasive blast cleaning is performed. Laitance, surface contaminants, and foreign material must be removed from the bridge deck surface.

If the deck surface becomes contaminated before placing methacrylate resin, abrasive blast clean the contaminated area and sweep the deck clean

Dispose of removed materials under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Measurement and Payment

Clean bridge deck will be measured and paid for by the square meter of deck surface cleaned.

The contract price paid per square meter for clean bridge deck includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in cleaning the bridge deck, including removing contrast treatment except slurry or chip seal contrast treatment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

PREPARE CONCRETE BRIDGE DECK SURFACE

This work shall consist of cleaning the portland cement concrete deck surface on bridges and the bikepath by using steel shot-blasting and blowing clean the deck surface, as shown on the plans and as described in these special provisions.

The Contractor shall submit plans and procedures for protecting the seismic joints and bikepath expansion joints in place during deck cleaning operations in conformance with the provisions in "Working Drawings," of these special provisions.

Materials

Steel shot must comply with SSPC-AB3. Recycled steel shot must comply with SSPC-AB2.

Construction

Abrasive blast clean the deck surface with steel shot. Remove all laitance, contaminents, and foreign material. Sweep the deck surface. Blow the deck surface clean using high-pressure air.

Laitance, surface contaminants, chip or slurry seal contrast treatments, and foreign material must be removed from the concrete deck surface.

If the deck surface becomes contaminated before placing the overlay, abrasive blast clean the contaminated area and sweep the deck clean.

Dispose of removed materials under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Measurement and Payment

Preparing concrete bridge deck surface will be measured by the square meter of surface which is prepared to receive the overlay, based on dimensions shown on the plans.

The contract price paid per square meter for prepare concrete bridge deck surface shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing the concrete bridge deck surface or concrete bikepath surface, except removal of slurry or chip seal contrast treatment, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Removal of slurry or chip seal contrast treatment will be paid for as extra work as specified in Section 4-l.03D, "Extra Work," of the Standard Specifications.

REMOVE CONCRETE

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete pavement to be removed will be measured by the cubic meter, measured before and during removal operations.

Removing concrete barrier (Type 60SC), and concrete barrier (Type K)will be measured by the meter, measured along the barrier before removal operations.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Concrete within construction limits, both inside and outside the highway right of way, shall be removed, except for curbs and sidewalks adjacent to frontage roads and through city streets.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

10-1.34 JACKING SUPERSTRUCTURE

Jacking superstructure shall consist of raising or lowering the superstructure of Oakland Approach Structures Eastbound at temporary Bent E19AR, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Attention is directed to "Order of Work" and "Falsework" in these special provisions.

Jacking height shall conform to the limits shown on the plans. Deviation from the maximum jacking height specified shall be reported to the Engineer immediately. Within 10 days after notifying the Engineer, the Contractor shall submit to the Engineer for approval a remediation plan for jacking the superstructure and this plan shall conform to the provisions in "Working Drawings," of these special provisions. The Contractor shall allow 15 working days for the Engineer's review.

Prior to jacking, the Contractor shall survey the deck adjacent to Hinge FE to determine deck elevations at temporary bent E19AR and calculate jacking distance. The deck elevations and jacking distance calculations shall be submitted to the Engineer for review. The time to be provided for the Engineer's review shall be 3 weeks.

The jacks shall be capable of jacking (raising or lowering) the superstructure 100 mm adjacent to eastbound Hinge FE at eastbound temporary Bent E19AR. The jacking system shall be capable of supporting a jacking reaction of not less than 19.7 MN adjacent to eastbound Hinge FE at eastbound temporary Bent E19AR.

The jack shall not be placed within 0.45 m of a utility opening. For jacking location adjacent to eastbound Hinge FE at eastbound temporary Bent E19AR, jacks shall be restricted to the jacking locations and distribution of loads as shown on the plans.

Systems involving modifications to the bridge that impair the structure integrity, intended serviceability or design capacity of the bridge shall not be used.

WORKING DRAWINGS

The Contractor shall submit working drawings for the jacking system to the Engineer for approval in conformance with the provisions in "Working Drawings" of these provisions. The time to be provided for the Engineer's review of the working drawings shall be 4 weeks.

Working drawing submittals shall include the following:

A. Descriptions and values of all loads, descriptions of equipment to be used, complete details and substantiating calculations for jacking procedure including a summary of computed stresses in the (1) jacks, (2) connection between jacks and the concrete bearing seats. The design of jacking procedure shall conform to the requirements in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications. The computed stresses shall include the effect of the jacking sequence.
B. Details of redundant system of support during the entire jacking operation for backup should the primary jacking system fail. The redundant system shall include stacks of steel plates that will be inserted or removed one by one as the superstructure is raised or lowered, respectively. Steel plates shall be maintained to within 6 mm of the superstructure soffit during the entire jacking process.
C. Details of mechanical connections between jacks and jacking seats.
D. Details of the monitoring and control devices to assure proper load distribution and jacking. The superstructure shall be jacked uniformly without distortion that would cause damage to the structure.

JACKING OPERATIONS

The falsework and jacking equipment shall accommodate the jacking load shown on the plans and any additional loads due to the Contractor's operation. At location adjacent to eastbound Hinge FE, jacking may be performed directly on top of eastbound temporary Bent E19AR as shown on the plans. The jacking system shall provide total stability of the structure throughout the jacking operations.

Each jack shall be equipped with either a pressure gage or a load cell for determining the jacking force. Pressure gages shall have an accurately reading dial at least 150 mm in diameter. Each jack shall be calibrated by a private laboratory approved by the Transportation Laboratory within 6 months prior to use and after each repair, unless otherwise directed. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

Prior to activating the jacks, the Contractor's engineer who is registered as a Civil Engineer in the State of California shall inspect the jacks, for conformity with the approved working drawings. The Contractor's registered engineer shall certify in writing that the jacks, including connections conform to the working drawings, and that the material and workmanship are satisfactory for the purpose intended. A copy of this certification shall be submitted to the Engineer prior to activating the jacks and shall be available at the site of the work at all times while the jacks are pressurized.

The Contractor's registered engineer shall be present at the bridge site at all times when jacking operations are in progress. Should an unplanned event occur, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure or proposed operation to correct or remedy for the occurrence.

A force necessary to raise the end of superstructure adjacent to Hinge FE shall be applied to the structure by the jacking system if directed by Engineer to compensate for settlement of eastbound temporary Bent E19AR. Jacking shall raise the structure to the elevation shown on the plans. The jacking force shall be maintained until the eastbound temporary Bent E19AR bearings have been shimmed to maintain the required structure elevation. The force shall not exceed the maximum allowable jacking forces shown on the plans without prior approval of the Engineer.

Jacking operations shall be carefully controlled and monitored to ensure that the jacking loads are applied simultaneously to each jacking point to prevent distortion and excess stresses that would damage the structure.

Should unanticipated displacements, cracking or other damage occur, the jacking shall be discontinued. The Contractor shall submit the corrective measures to the Engineer and the Contractor shall allow the Engineer 5 working days for review. If the Contractor's proposed measures are approved by the Engineer, the jacking operation may resume.

Damage to the structure as a result of the Contractor's operations shall be repaired or replaced by the Contractor at the Contractor's expense in accordance with the requirements for new work of similar character.

Pressure on the jacks shall be slowly released from all jacks simultaneously conforming to the construction sequence shown on the plans.

After release of the superstructure, all members installed on the bridge for jacking the superstructure shall be removed.

PAYMENT

Jacking superstructure will be paid for on a lump sum price basis. The contract lump sum price paid for jacking superstructure shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in jacking the superstructure and any necessary counterweight, shims and adjustments to bearing, including surveying and shimming, complete in place as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 TREATED WOOD WASTE

GENERAL

Summary

This work includes handling, storing, transporting, and disposing of treated wood waste (TWW).

Wood removed from roadside signs and metal beam guard railing is treated with one or more of the following:

1. Creosote
2. Pentachlorophenol
3. Copper azole
4. Copper boron azole
5. Chromated copper arsenate
6. Ammoniacal copper zinc arsenate
7. Copper naphthenate
8. Alkaline copper quaternary

Manage TWW under Title 22 CA Code of Regulations, Division 4.5, Chapter 34.

Submittals

For disposal of TWW submit a copy of each completed shipping record and weight receipt to the Engineer within 5 business days of disposal.

CONSTRUCTION

Provide training to personnel who handle TWW or may come in contact with TWW that includes:

1. All applicable requirements of Title 8 CA Code of Regulations
2. Procedures for identifying and segregating TWW
3. Safe handling practices
4. Requirements of Title 22 CA Code of Regulations, Division 4.5, Chapter 34
5. Proper disposal methods

Store TWW before disposal using any of the following methods:

1. Elevate on blocks above a reasonably foreseeable run-on elevation and protect from precipitation
2. Place in water-resistant containers designed for shipping or solid waste collection
3. Place on a containment surface or pad protected from run-on and precipitation
4. Place in a storage building as defined in Title 22 CA Code of Regulations, Div. 4.5, Chp. 34, Section 67386.6 (a)(2)(c)

Prevent unauthorized access to TWW using a secured enclosure such as a locked chain link fenced area or a lockable shipping container located within the project limits.

Resize and segregate TWW at a location where debris from the operation including sawdust and chips can be contained. Collect and manage the debris as TWW.

Provide water-resistant labels, that comply with Title 22 CA Code of Regulations, Division 4.5, Chapter 34, to clearly mark and identify TWW and accumulation areas. Labels must include:

1. Caltrans, District number, Construction, contract number
2. District office address
3. Engineer's name, address, and telephone number
4. Contractor's contact name and telephone number
5. Date placed in storage

Before transporting TWW, obtain an agreement from the receiving facility that the treated wood waste will be accepted. Protect shipments of treated wood waste from loss and exposure to precipitation. For projects with 4,536 kg or more of TWW, request a hazardous waste generator identification number from the Engineer at least 5 business days before the first shipment. Each shipment must be accompanied by a shipping record such as a bill of lading or invoice that includes:

1. Caltrans with district number
2. Construction contract number
3. District office address
4. Engineer's name, address, and telephone number
5. Contractor's contact name and telephone number
6. Receiving facility name and address
7. Waste description: treated wood waste (preservative type if known or unknown/mixture)
8. Project location
9. Estimated quantity of shipment by weight or volume
10. Date of transport
11. Date of receipt by the receiving TWW facility
12. Weight of shipment as measured by the receiving TWW facility
13. For projects with 4,536 kg or more of TWW include the generator identification number

The shipping record must be at least a 4-part carbon or carbonless 216 mm x 279 mm form to allow retention of copies by the Engineer, transporter, and disposal facility.

Dispose of TWW at an approved TWW facility. A list of currently approved TWW facilities may be viewed at:

http://www.dtsc.ca.gov/HazardousWaste/upload/TWW_Confirmed_Landfill_List.pdf

Dispose of TWW within:

1. 90 days of generation if stored on blocks
2. 180 days of generation if stored on a containment surface or pad.
3. One year of generation if filling a water-resistant container, or 90 days after the container is full, whichever is shorter
4. One year of generation if storing in a storage building as defined in Title 22 CA code of Regulations, Div. 4.5, Chp. 34, Section 67386.6(a)(2)(C)

MEASUREMENT AND PAYMENT

Full compensation for handling, storing, transporting, and disposing TWW, including personnel training, is included in the contract price paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.36 REMOVE YELLOW TRAFFIC STRIPE AND PAVEMENT MARKING (HAZARDOUS WASTE)

GENERAL

Summary

This work includes removing existing yellow thermoplastic and yellow painted traffic stripe and pavement marking at the locations shown on the plans. The residue from the removal of this material is a hazardous waste.

Residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking contains lead chromate. The average lead concentration is greater than or equal to 1000 mg/kg total lead or 5 mg/l soluble lead. When applied to the roadway, the yellow thermoplastic and yellow painted traffic stripe and pavement marking contained as much as 2.6 percent lead. Residue produced from the removal of this yellow thermoplastic and yellow painted traffic stripe and pavement marking contains heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs. For bidding purposes, assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.. Yellow thermoplastic and yellow paint may produce toxic fumes when heated.

Submittals

Lead Compliance Plan: Prepare and submit a lead compliance plan to prevent or minimize worker exposure to lead while managing and handling traffic stripe residue, and pavement marking residue containing lead. Regulations containing specific Cal/OSHA requirements when working with lead include 8 CA Code of Regs § 1532.1.

The plan must contain the items listed in 8 CA Code of Regs § 1532.1(e)(2)(B). Before submittal, a CIH must sign and seal the plan. Submit the plan at least 7 days before starting any activity that presents the potential for lead exposure. The Engineer notifies you of the acceptability of the plan within 4 business days of receipt.

Before starting any activity that presents the potential for lead exposure to employees who have no prior training, including State employees, provide a safety training program to these employees that complies with 8 CA Code of Regs § 1532.1 and your lead compliance program.

Submit copies of air monitoring or job site inspection reports made by or under the direction of the CIH under 8 CA Code of Regs § 1532.1 within 10 days after the date of monitoring or inspection.

Supply personal protective equipment, training, and washing facilities required by your lead compliance plan for ten (10) State employees.

Work Plan: Submit a work plan for the removal, containment, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking for acceptance not less than 15 days prior to the start of the removal operations. The work plan must include:

1. Objective of the operation
2. Removal equipment
3. Type of hazardous waste storage containers
4. Container storage location and how it will be secured
5. Hazardous waste sampling protocol and QA/QC requirements and procedures
6. Qualifications of sampling personnel
7. Analytical lab that will perform the analyses
8. Certification documentation of the hazardous waste hauler that will transport the hazardous waste
9. Disposal site that will accept the hazardous waste residue

The Engineer will review the work plan within 5 business days of receipt.

Do not perform work that generates hazardous waste residue until the work plan has been accepted by the Engineer. The Engineer's review and acceptance does not waive any contract requirements and does not relieve the Contractor from complying with Federal, State, and local laws, regulations, and requirements.

Correct any rejected work plan and resubmit a corrected work plan within 5 business days of notification by the Engineer; at which time a new review period of 5 business days will begin.

Analytical Test Results: Submit analytical test results of the residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking, including chain of custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile requested by the disposal facility
2. Requesting the Engineer obtain an EPA ID no. for disposal
3. Removing the residue from the site

United States Environmental Protection Agency Identification Number Request: Submit a request for the U.S. EPA ID no. when the Engineer accepts analytical test results documenting that residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking is a hazardous waste.

Disposal Documentation: Submit receiving landfill documentation of proper disposal within 5 business days of residue transport from the project.

CONSTRUCTION

Where grinding or other approved methods are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking that will produce a hazardous waste residue, the removed residue, including dust, must be contained and collected immediately. Use a HEPA filter-equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods for collection of the residue.

Store hazardous waste residue in labeled and covered containers. Labels must comply with the provisions of 22 CA Code of Regs §§66262.31 and 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with thermoplastic or paint)
4. The word "Toxic"
5. Name, address, and telephone no. of the Engineer
6. Contract no.
7. Contractor or subcontractor name

Use metal containers approved by the U.S. Department of Transportation for the transportation and temporary storage of the removed residue. Handle the containers such that no spillage occurs. Store containers in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits until disposal as approved.

Make necessary arrangements to test the yellow thermoplastic and yellow paint hazardous waste residue as required by the disposal facility and these special provisions. Testing must include, at a minimum:

1. Total lead by EPA Method 6010C
2. Total chromium by US EPA Method 7000 series
3. Soluble lead by California Waste Extraction Test
4. Soluble chromium by California Waste Extraction Test
5. Soluble lead by Toxicity Characteristic Leaching Procedure
6. Soluble chromium by Toxicity Characteristic Leaching Procedure

From the 1st 840 L of hazardous waste or portion thereof if less than 840 L of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 3360 L of hazardous waste or portion thereof if less than 3360 L are produced, a minimum of 1 additional random sample must be taken and analyzed. Use chain of custody procedures consistent with Chapter 9 of U.S. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the project to the laboratory. Each sample must be homogenized before analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses must then be taken. This aliquot must be homogenized a 2nd time and the total and soluble analyses run on this aliquot. The homogenization process must not include grinding of the samples. Submit the name and location of the disposal facility that will be accepting the hazardous waste and the analytical laboratory along with the testing requirements not less than 5 business days before the start of removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking. The analytical laboratory must be certified by the CA Department of Public Health Environmental Laboratory Accreditation Program for all analyses to be performed.

After the Engineer accepts the analytical test results, dispose of yellow thermoplastic and yellow paint hazardous waste residue at a Class 1 disposal facility located in CA under the requirements of the disposal facility operator within 90 days after accumulating 100 kg of residue and dust.

If less than 100 kg of hazardous waste residue and dust is generated in total, it must be disposed of within 90 days after the start of accumulation of the residue and dust.

Use a hazardous waste manifest and a transporter registered with the CA Department of Toxic Substance Control. The Engineer will obtain the U.S. EPA ID no. and will sign all manifests as the generator within 2 business days of receiving and accepting the analytical test results and receiving your request for the U.S. EPA ID no.

If analytical test results demonstrate that the residue is a non–hazardous waste and the Engineer agrees, dispose of the residue at an appropriately permitted Class II or Class III facility under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract price paid per meter for remove yellow thermoplastic traffic stripe (hazardous waste) and remove yellow painted traffic stripe or per square meter for remove yellow thermoplastic pavement marking and remove yellow painted pavement marking includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all of the work involved in removal, containment, storage, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for lead compliance plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and implementing the plan as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for (1) work plan for the removal, containment, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking hazardous waste residue, (2) analytical test results, (3) US EPA ID no. request, and (4) receiving landfill documentation of proper disposal are included in the contract prices paid per linear meter for remove yellow thermoplastic traffic stripe and remove yellow painted traffic stripe or per square meter for remove yellow thermoplastic pavement marking and remove yellow painted pavement marking and no separate payment will be made therefor.

If analytical test results demonstrate that the residue is a non–hazardous waste and the Engineer agrees to disposal at a non–hazardous waste disposal facility, no cost adjustment will be made.

10-1.37 SAMPLING AND REMOVAL OF ASBESTOS-CONTAINING MATERIAL

GENERAL

Summary

This work includes inspection for asbestos-containing material (ACM), sample collection and analysis of suspected ACM, regulatory notification, removal of ACM, and disposal of ACM.

Definitions

asbestos: Includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that has been chemically treated and/or altered.

asbestos-containing material (ACM): Any building material, including asbestos cement pipe, that contains commercial asbestos in an amount greater than 1% by weight, area, or count.

certified asbestos consultant: An asbestos consultant certified by the Division of Occupational Safety and Health under 8 Code of Regs § 341.15 and 1529.

certified industrial hygienist: A person certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.

Submittals

Asbestos Inspection Plan (Bridge Removal): At least 60 days before starting bridge removal, submit an asbestos inspection plan that establishes the procedures to comply with requirements for asbestos inspection, including:

1. Sampling procedures
2. Analytical method for analyses
3. Sample handling and preservation

Sampling and analysis must comply with USEPA Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance. The Engineer returns the plan within 15 days of the submittal for revision if needed. Revise the plan within 5 days and resubmit. The Engineer accepts the revised plan within 5 days if the revisions address any deficiencies. Do not start sampling and analysis work until the plan is accepted by the Engineer.

Asbestos Sampling and Analysis Report: Submit a report on the asbestos inspection within 10 days after completion of the inspection. The report must include:

1. Sampling protocols
2. Photographs of the structures and of the locations where samples were taken
3. Chain of custody
4. Laboratory data

Allow 5 days for the Engineer to review and accept the report. Make any changes requested for acceptance within 5 days. Submit 4 copies of the final report to the Engineer.

Air Quality Management District Notification of Demolition: Provide a copy of the required notification form and attachments to the Engineer before submittal to the Air Quality Management District.

Asbestos Compliance Plan: At least 15 days before starting work in areas containing or suspected to contain asbestos, submit an Asbestos Compliance Plan (ACP) that specifies work practices that will be followed to prevent or minimize exposure to asbestos. Attention is directed to Title 8, California Code of Regulations, Construction Safety Orders, Section 5192 (b) and Section 1529, "Asbestos", Occupational Safety and Health Guidance Manual published by the National Institute of Occupational Safety and Health (NIOSH) and the USEPA for elements of the ACP. The ACP must be signed by a certified industrial hygienist. The ACP must include:

1. Identification of key personnel for the project
2. Job hazard analysis for work assignments
3. Summary of risk assessment
4. Personal protective equipment
5. Delineation of work zones on-site
6. Decontamination procedures
7. General safe work practices
8. Security measures
9. Emergency response plans
10. Worker training

Quality Control and Assurance

Qualifications: The person in charge of asbestos inspection and abatement planning must be a certified asbestos consultant.

The person in charge of asbestos removal must be registered under Labor Code § 6501.5 and certified under Bus & Prof Code § 7058.6.

Regulatory Notifications: Notify the Bay Area Air Quality Management District (BAAQMD) under National Emission Standards for Asbestos, 40 CFR Pt 61, Subpart M, Health & Safety Code § 39658(b)(1), and the California Air Resources Board regulations - BAAQMD Reg 11. Rule 2. Submit the notification at least 10 business days before starting demolition. Notification forms may be obtained at:

http://www.baaqmd.gov/Forms.aspx

Deliver the original notification form with any necessary attachments to:

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109-7799

APCO - Jack Broadbent
(415) 749-5052

Notify the APCO of changes to removal or demolition plans, including discovery of ACM during demolition or excavation, within 2 business days of the change.

Notify the Division of Occupational Safety and Health under 8 CA Code of Regs § 341.9.

Training: Before starting work in areas containing or suspected to contain asbestos, personnel who have no prior training or are not current in their training status, including State personnel, must complete a safety training program that meets the requirements of 8 CA Code of Regs § 1529. Provide a written certification of completion of safety training for trained personnel before starting work in areas containing or suspected to contain asbestos.

Equipment and Medical Surveillance: Provide personal protective equipment, training, and medical surveillance required by the Asbestos Compliance Plan to State personnel. The number of State personnel will be ten (10).

CONSTRUCTION

Asbestos Inspection (Bridge Removal)

Collect a minimum of one sample per suspected ACM location. For pipes and other linear components of suspected ACM, collect one sample per 1.5 meter of exposed material. Sample all exposed suspected ACM on the structure. Sample suspected ACM encased in concrete when exposed during demolition. Analyze samples using analytical method 600/R-93-116 specified in 40 CFR Pt 763 Subpart F, Appendix A (Polarized Light Microscopy).

Transport samples under the chain of custody to the laboratory within 24 hours of sampling. The laboratory must test the samples within 48 hours. Submit laboratory results as soon as they are available.

Suspected ACM Discovered during Demolition or Excavation

If suspected ACM is discovered during demolition or excavation, the portion of the work that involves the suspected ACM must be performed by or under the supervision of licensed and certified personnel. Qualified personnel must be on the job site during work to remove the upper deck of the bridge when a full bridge closure is in effect to prevent delay. Test the suspected ACM in compliance with the Asbestos Inspection Plan (Bridge Removal) before disposal.

Removal

Comply with CA 8 Code of Regs and BAAQMD Reg 11, Rule 2. Remove friable ACM using the wetting method. Remove non-friable ACM using a method that prevents breakage. ACM encased in concrete or other similar structural material does not have to be removed before demolition, but must be adequately wetted whenever exposed during demolition. Prevent visible emissions from all ACM removal activities.

Asbestos removal procedures include:

1. Installing asbestos warning signs at perimeters of abatement work areas.
2. Wetting asbestos materials with sprayers.
3. Containing large volumes of asbestos materials in disposal bins for temporary storage until removed from the site.
4. Providing manifests for waste disposal upon completion for the Engineer to sign.
5. Providing transporters registered to transport hazardous waste in the State of California under Health and Safety Code Ch 6.5, Div 20 and 22 Code of Regs, Div 4.5.
6. Disposing of asbestos materials at a permitted disposal facility.
7. Working in accordance with federal, state, and local requirements for asbestos work.

Mark all regulated work areas with the following or equivalent warning:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

Packaging

Comply with 22 CA Code of Regs, Division 4.5, Chapter 12, Article 3 requirements for packaging and labeling removed ACM. Place removed ACM in approved plastic containers (double ply, 0.15 mm minimum thickness, plastic bags) with caution labels affixed to bags. Caution labels must have conspicuous, legible lettering, that spells out the following or equivalent warning:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

The removed materials containing asbestos may be placed directly into a covered roll off or drop box that has the same caution label affixed on all sides.

Transportation

All haulers of friable ACM must have current registration with the State Department of Toxic Substances Control (DTSC) for transporting hazardous waste and have a U.S. Environmental Protection Agency Identification Number (U.S. EPA I.D. Number). All vehicles used to transport hazardous waste material must carry a valid registration during transport.

Disposal

The Engineer obtains the required EPA generator identification numbers and signs the hazardous waste manifests for disposal of ACM. Request a generator identification number from the Engineer at least 5 days before the first shipment. Dispose of friable and non-friable waste containing asbestos at a disposal facility permitted to accept the waste and that meets all the requirements specified by federal, state, and local regulations. Notify the proper authorities at the disposal site in advance of delivery of ACM. Conduct additional sampling deemed necessary by the owner of the disposal facility for acceptance of the material. Provide a copy of all waste shipment records to the Engineer within 35 days after shipment.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for asbestos compliance plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Asbestos Compliance Plan, including review by a certified industrial hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for asbestos inspection (bridge removal) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals and for doing all the work involved in performing the asbestos inspection, complete in place, including planning, sample collection, analysis, and report preparation as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for removal, transportation, and disposal of ACM shown on the plans is included in the contract items of work involved and no additional compensation will be allowed therefor.

Removal, transportation, and disposal of ACM that is discovered during the asbestos inspection, demolition, or excavation will be paid for as extra work as specified in Section 4 1.03D, "Extra Work," of the Standard Specifications.

10-1.38 VIBRATION MONITORING

This work shall consist of furnishing, installing and maintaining vibration-monitoring instrumentation; collecting vibration data; and interpreting and reporting the results of vibration monitoring as specified herein. This work shall include the implementation by the Contractor of any required remedial and precautionary measures, using the vibration monitoring data, to protect the following facilities from excess vibration during construction activities:

1. EBMUD Outfall Structure
2. EBMUD Dechlorination Facility
3. Caltrans Mole Substation
4. Historical Mole Substation
5. Historical Key Building

GENERAL

The Contractor shall be responsible for the following, including but not limited to:

1. Furnish and install vibration-monitoring instrumentation.
2. Protect from damage and maintain instruments installed by the Contractor and repair or replace damaged or inoperative instruments.
3. Collect, interpret and report data from instrumentation specified herein.
4. Implement response actions.

The Department is not responsible for the safety of the work based on vibration-monitoring data, and compliance with this Section does not relieve the Contractor of full responsibility for damage caused by the Contractor's operations.

VIBRATION MONITORING PERSONNEL

The Contractor's vibration-monitoring personnel shall have the qualifications specified herein. Vibration monitoring may be on the staff of the Contractor. However, they shall not be employed nor compensated by subcontractors, or by persons or entities hired by subcontractors, who will provide other services or material for the project.

The Contractor's vibration-monitoring personnel shall include a Vibration Instrumentation Engineer who meets one of the following minimum qualifications:

1. Registered Geophysicist or Professional Engineer in the State of California with at least 5 years of experience in the installation and use of vibration-monitoring instrumentation and data interpretation.
2. Graduate level degree from an accredited University in Physics or Acoustics with at least 5 years experience in the installation and use of vibration-monitoring instrumentation and data interpretation.

The Vibration Instrumentation Engineer shall:

1. Be on site and supervise the initial installation of each vibration-monitoring instrument.
2. Supervise interpretations of vibration-monitoring data.

The Contractor's vibration-monitoring personnel shall be subject to the Engineer's approval.

SUBMITTALS

Prior to any significant impact work and prior to performing any vibration monitoring, the Contractor shall submit to the Engineer a written vibration monitoring plan, vibration monitoring equipment manufacturer's product data and the resumes of the Vibration Instrumentation Engineer and any vibration monitoring technical support personnel.

The vibration monitoring equipment manufacturer's data shall describe in detail all vibration-monitoring instruments. Requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

The resumes of the Vibration Instrumentation Engineer and any vibration monitoring technical support personnel shall be sufficient to define details of relevant experience.

The written vibration monitoring plan shall detail the procedures for vibration monitoring. Such details shall include, but not limited to:

1. The name of the Firm providing the vibration monitoring services.
2. Description of the instrumentation and equipment to be used.
3. Measurement locations and methods for mounting the vibration sensors.
4. Procedures for data collection and analysis.
5. Means and methods of providing warning when the particle velocity equals or exceeds specified limits.
6. Generalized plans of action to be implemented in the event the particle velocity equals or exceeds specified limits. The generalized plans of action shall be positive measures by the Contractor to control vibrations (e.g. using alternative construction methods).
7. Name of the "responsible person" designated by the Contractor. The responsible person designated by the Contractor shall have the authority to stop the work causing the vibration.

Within 5 days of receipt of each instrument at the site, the Contractor shall submit to the Engineer a copy of the instruction manual and the laboratory calibration and test equipment certification.

In addition, the Contractor shall submit data and reports as specified in "Data Reduction, Processing, Plotting and Reporting" in these special Provisions.

The review period shall be the same as those set forth in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

VIBRATION MONITORING EQUIPMENT

The Contractor shall provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. Seismographs shall be Model DS-477 Blastmate II as manufactured by Instantel Inc., Kanata (Ottawa), Ontario, Canada, Model VMS-500 as manufactured by Thomas Instruments, Inc., Spofford, NH, or Model NC5310/D, as manufactured by Nomis Inc., Birmingham, AL, or acceptable equivalent. The seismograph shall have the following minimum features:

1. Seismic range: 0.25 to 102-mm per second with an accuracy of +5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.25-mm per second or less.
2. Frequency response (+3 dB points): 2 to 200 Hertz.
3. Three channels for simultaneous time-domain monitoring of vibration velocities in digital format on three perpendicular axes.
4. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
5. Capable of internal, dynamic calibration.
6. Direct writing to printer and capability to transfer data from memory to external device. Instruments must be capable of producing strip chart recordings of readings on site within one hour of obtaining the readings. Provide computer software to perform analysis and produce reports of continuous monitoring.
7. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of one minute or less.
8. One seismograph must be water-proof and capable of downhole stationing.

Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate a product that is the same or better than the product named in the specifications in function, quality, performance, reliability, and general configuration. This procedure is not to be construed as eliminating other manufacturers' suitable products of equal quality.

The Contractor may request to substitute an "acceptable equivalent" vibration monitoring equipment and shall submit complete comparative data to the Engineer for consideration of another product. Any request from the Contractor for consideration of a substitution shall clearly state the nature of the deviation from the product specified. Substitute products shall not be used in the work unless accepted by the Engineer in writing. The Engineer will be the sole judge of the suitability and equivalency of the proposed substitution.

The Contractor's instrumentation personnel shall conduct regular maintenance of seismograph installations.

All seismographs shall have been calibrated by the manufacturer or certified calibration laboratory within one year of their use on site. A current certificate of calibration shall be submitted to the Engineer with the Contractor's data.

A record of laboratory calibration shall be provided for all vibration-monitoring instruments to be used on site. Certification shall be provided to indicate that the instruments are calibrated and maintained in accordance with the equipment manufacturer's calibration requirements and that calibrations are traceable to the U. S. National Institute of Standards and Technology (NIST).

VIBRATION MONITORING

The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components for vibration monitoring. At the above listed locations, vibration monitoring and recording shall be performed during the course of all significant impact work, when that activity occurs within 26 meters of the said facility. The 26 meters shall be measured from the edge of the construction activity.

The Contractor shall notify the Engineer at least 24 hours prior to starting a new vibration-producing construction task, and shall have the seismographs in place and functioning properly prior to any work within 26 meters as defined above. No work occurring within this zone shall occur unless monitoring equipment is functioning properly.

The equipment shall be set up in a manner such that an immediate warning is given when particle velocity equal to or exceeding 5 millimeters per second is produced. The warning emitted by the vibration-monitoring equipment shall be instantaneously transmitted to the responsible person designated by the Contractor by means of warning lights, audible sounds or electronic transmission.

Monitoring equipment shall be stationed within 0.9 meters of the exterior of designated facilities on the side facing the Contractor's work site. For facilities whose frontage exceeds 60 meters, at least 2 monitors shall be utilized at that location.

The seismographs shall be installed such that the longitudinal and transverse directions of measurement are parallel and perpendicular to the feeder alignment, respectively.

A downhole waterproof seismograph (e.g., a downhole three-directional geophone calibrated to measure ground velocities) shall be installed on the centerline of the EBMUD outfall; and three seismographs shall be deployed and stationed on the existing ground surface at zero, and 3-m intervals from the centerline of the outfall and normal to the axis of the alignment on the side closest to the contractor's work. The seismographs shall be placed on a straight line normal to the axis of the outfall coinciding with the centerline of the each pile. These four seismographs shall provide ground vibrations at a few locations to evaluate attenuation of the ground vibrations with distance from the source.

When any reading on monitoring equipment equals or exceeds 10 millimeters per second, work shall immediately cease and the Contractor shall immediately notify the Engineer. If directed by the Engineer, the Contractor shall submit within 24 hours a detailed specific plan of action so that the vibration limits are not violated. The Contractor shall take whatever action is necessary to reduce and maintain the monitoring equipment reading below a particle velocity of 10 millimeters per second.

The seismograph vibration sensors shall be firmly mounted on the surface slab of concrete or asphalt, or firmly set in undisturbed soil.

DATA COLLECTION

Prior to any vibration-producing construction activity, the Contractor shall collect seismograph data to document background vibrations at each monitoring location. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals, which shall be printed on a strip chart. The background monitoring shall be performed for a minimum of two non-consecutive workdays, spanning the hours during which construction activities will take place.

The Contractor shall monitor vibration during significant vibration-producing construction activities. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals, which shall be printed on a strip chart. During the monitoring, the Contractor shall document all events that are responsible for the measured vibration levels, and submit the documentation to the Engineer with the data as specified in section "Data Reduction, Processing, Plotting and Reporting" in these Special Provisions. A record form "Construction Vibration Monitoring Field Data Form" for documenting these events could be found in "Supplemental Project Information," of these special provisions.

All vibration monitoring data shall be recorded contemporaneously and plotted continuously on a graph by the data acquisition equipment. Each graph shall show time-domain wave traces (particle velocity versus time) for each transducer with the same vertical and horizontal axes scale.

DATA REDUCTION, PROCESSING, PLOTTING AND REPORTING

Within 10 working days after the completion of the background vibration monitoring, the Contractor shall submit to the Engineer a hard copy report documenting the results at each of the monitoring locations.

During bridge construction, the Contractor shall provide weekly, hard copy reports summarizing any vibration monitoring data collected at the specified vibration-monitoring locations. The reports for each week shall be submitted on or before the end of the following week.

All reports shall be signed by the approved Vibration Instrumentation Engineer, and shall include the following:

1. Project identification, including District, County, Route, Post Mile, Project Name and Bridge number as shown on the project plans.
2. Location of the monitoring equipment.
3. Location of vibration sources (e.g. traffic, demolition equipment, etc.)
4. Summary tables indicating the date, time and magnitude and frequency of maximum single-component peak particle velocity measured during each one-hour interval of the monitoring period.
5. Field data forms (construction vibration monitoring only).
6. Appendix graphs of the strip charts printed during the monitoring periods.

In addition to the hard copy data specified herein, the Contractor shall provide data on 90-mm diskettes with each report. Electronic data files for all instrument data shall be provided in dBASE IV (.DBF) format.

The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent of the Department.

PAYMENT

The contract lump sum price paid for vibration monitoring shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for performing all work involving vibration monitoring, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.39 PHOTO SURVEY OF EXISTING FACILITIES

GENERAL

Summary

This work includes performing photo surveys and crack monitoring of existing facilities which could be damaged by the Contractor's operations.

The Contractor shall perform crack monitoring and photo survey of the following existing facilities:

1. EBMUD Dechlorination Facility
2. Caltrans Mole Substation
3. Historical Mole Substation
4. Historical Key Building

The Contractor shall perform photo surveys prior to and after performing pile driving of Bridge No. 34-0006R and Outfall Bridge No. 33-0742Y, installation and removal of falsework, bridge removal, and as directed by the Engineer. No pile driving of Bridge No. 34-0006R and Outfall Bridge No. 33-0742Y, installation and removal of falsework, or bridge removal shall take place until the Engineer approves the first photo survey.

The photo surveys shall consist of both photographic and video recordings of the conditions (internal and external cracks, settlements, leakages, and the like) of the specified facilities including the foundation, walls, ceiling, roof, and other elements on the interiors and exteriors.

Crack monitoring shall be performed on all existing cracks with a monitoring device approved by the Engineer. The crack monitoring device shall be capable of measuring cracks to the nearest millimeter. Crack monitoring shall be performed daily throughout the duration of the pile driving, falsework, bridge removal, and as directed by the Engineer. The initial crack measurement shall be completed with the first photo survey.

Cracks shall be measured in length and width. The crack measurements shall be recorded at the same time each day in an effort to eliminate deviations in crack magnitude due to heat fluctuations.

The Contractor shall notify the Engineer 48 hours prior to beginning the photo survey and crack monitoring work.

The Contractor shall obtain consent from property owners prior to performing any photo survey or crack monitoring. Refusal of a property owner to allow photo survey or crack monitoring shall be duly documented by the Contractor.

The photo survey and crack monitoring are intended for use as indisputable evidence in ascertaining the extent of any damage which may occur as a result of the Contractor's operations. The photo survey and crack monitoring are for the protection of the property owners, the Contractor, and the State. The photo survey and crack monitoring will be the means of determining whether any damage occurred during the contract work.

The Contractor shall immediately inform the Engineer in writing of any damage to these facilities.

Submittals

Work Plan

Submit a work plan at least 10 working days prior to the pre-construction photo survey. The work plan shall include a schedule of activities, equipment to be used, and a comprehensive description of work to be completed at each facility, including the locations of all cracks to be monitored and a sample crack monitoring report. The Engineer shall have 5 working days to review the submittal for adequacy. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the work plan within 5 working days. The Contractor shall provide the Engineer with 3 copies of the approved work plan.

Pre-Construction and Post-Construction Photo Survey

Submit a pre-construction photo survey at least 10 working days prior to start performing pile driving of Bridge No. 34-0006R and Outfall Bridge No. 33-0742Y, installation and removal of falsework, and bridge removal. Submit a post-construction photo survey within 5 working days after the completion of pile driving, falsework, and bridge removal operations. The Engineer shall have 5 working days to review the pre-construction and post-construction photo survey submittals for adequacy. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the photo survey within 5 working days. The Contractor shall provide the Engineer with 4 copies of the approved pre-construction and post-construction photo survey.

The pre-construction and post-construction photo survey shall consist of both photographic and video recordings in digital format of the conditions of the specified facilities including the foundation, walls, ceiling, roof, and other elements on the interiors and exteriors (internal and external cracks, settlements, leakages, and the like).

Photographs shall be in color and shall have a minimum resolution of 762 dots per cm on a 20.3 cm x 25.4 cm photograph. All photographs shall be indexed, and identified by date, location, and orientation.

The video recording shall be narrated contemporaneously by the camera operator, documenting the location, orientation, time, and date of the scene. The narration may be supplemented by onscreen text either generated by the camera or by other methods approved by the Engineer. All video and audio recordings shall be made to the highest quality and standards. The video recording shall be taken in well lit conditions and capable of documenting architectural cracking in structures. All video recording shall be High Definition (HD) with 1080 horizontal lines of vertical resolution and 30 frames per second. Individual video files shall not exceed 10 minutes in length and shall be indexed, and labeled with date, location, and orientation.

HD video recordings shall be made in a format that can be edited, is free of any copy protection, and is viewable by freeware or shareware such as VLC Media Player or an acceptable equivalent. All video recordings shall be stored on a labeled single layer Digital Versatile Disk (DVD) optical disk storage media and provided to the Engineer. The index shall also be submitted in PDF format with the video recordings in the optical disk storage media.

All photos shall be stored in JPEG file format and on a labeled Compact Disc (CD), or single layer DVD optical disk storage media and provided to the Engineer. The index with date, location, and orientation shall also be submitted in PDF format with the photos in the optical disk storage media.

All video and photo optical disk storage media shall be submitted in a 3-ring binder and shall include the following: protective photo sleeves, building layout, and summary sheets indexing all photographs.

Crack Monitoring Report

Submit a crack monitoring report detailing the recorded measurements and the locations of the cracks biweekly.

PAYMENT

The contract lump sum price paid for photo survey of existing facilities, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in performing photo survey and crack monitoring, including furnishing 6 sets of the approved initial and final photo survey records, as specified in these special provisions, and as directed by the Engineer.

Additional photo surveys of existing facilities other than those facilities listed under this special provision will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

10-1.40 SEWER VIDEO SURVEY

GENERAL

Summary

This work includes performing a video survey and providing an inspection report on the condition of the interior of the existing East Bay Municipal Utility District (EBMUD) reinforced concrete outfall pipe before and after the construction of the Outfall Bridge, Bridge No. 33-0742Y.

Permits

The Contractor must apply for a Permit to Enter and an Underwater Operations Permit from the EBMUD Wastewater Planning Section (WPS), Telephone (510) 287-1141, at least 35 working days prior to initiating any work within the EBMUD outfall pipe easement. The Permit to Enter and the Underwater Operations Permit must be submitted with copies of the Operation and Safety Procedure Plan and Contingency Plan.

Submittals

Submit the following:

1. Operation and Safety Procedure Plan
   At least 20 working days prior to conducting the video survey of the EBMUD outfall pipe, submit to the Engineer for review and acceptance 4 copies of the operation and safety procedure plan for emergencies involving work with the EBMUD pipe. The Engineer will have 10 working days to review and accept the plan. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the plan within 5 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the plan, 4 additional copies of the Operation and Safety Procedure plan incorporating the required changes must be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the plan. In order to allow construction activities to proceed, the Engineer may conditionally approve the Operation and Safety Procedure plan while minor revisions or amendments are being completed.
2. Contingency Plan
   At least 20 working days prior to conducting the video survey of the EBMUD outfall pipe, submit to the Engineer for review and acceptance 4 copies of the contingency plan. The Engineer will have 10 working days to review and accept the plan. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the plan within 5 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the plan, 4 additional copies of the Contingency plan incorporating the required changes must be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the contingency plan. In order to allow construction activities to proceed, the Engineer may conditionally approve the Contingency plan while minor revisions or amendments are being completed.

3. Pre-Construction Inspection Report
At least 10 working days before starting the construction of the Outfall Bridge, submit 4 copies of the pre-construction inspection report to the Engineer for review and acceptance. The Engineer will have 5 working days to review and accept the report. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the report within 5 working days of receipt of the Engineer's comments. Upon the Engineer's approval of the plan, 4 additional copies of the report incorporating the required changes must be submitted to the Engineer. After acceptance by the Engineer the contractor must provide 2 copies of the inspection report to the EBMUD (WPS). The Pre-Construction inspection report must include the following:

3.1. The type, condition, and location of all structural deficiencies, including reduced cross sectional areas, protrusions, cracks, holes, exposed aggregates and reinforcing bars, honey combed areas, damaged or offset construction joints, deteriorated concrete surfaces, infiltrations, root intrusions, missing pieces, and the condition of the manholes and the manhole covers. The locations of all deficiencies found in the outfall pipe must be shown by distances with reference points agreed upon by the Contractor and the Engineer.
3.2. Continuous voice recording describing defects and features found.
3.3. A clear digital photo or video picture capture of all structural deficiencies found.
3.4. The dimensions of all major structural deficiencies found.
3.5. A copy of the outfall video survey in high quality electronic media. The video media must include the following information:

3.5.1. Voice recording
3.5.2. Recording number
3.5.3. Inspection date
3.5.4. Current distance along outfall (counter meter)
3.5.5. Printed labels on video recording hard copy with location and date

4. Post-Construction Inspection Report
At least 7 working days after the construction of the Outfall Bridge, submit 4 copies of the post construction inspection report to the Engineer for review and acceptance. The Engineer will have 5 working days to review and accept the report. If revisions are required, as determined by the Engineer, the Contractor must revise and resubmit the report within 5 working days of receipt of the Engineer's comments. Upon the Engineer's approval of the plan, 4 additional copies of the report incorporating the required changes must be submitted to the Engineer. After acceptance by the Engineer provide 2 copies of the inspection report to the EBMUD (WPS). The Post-Construction inspection report must include the following:

4.1. The type, condition, and location of all structural deficiencies, including reduced cross sectional areas, protrusions, cracks, holes, exposed aggregates and reinforcing bars, honey combed areas, damaged or offset construction joints, deteriorated concrete surfaces, infiltrations, root intrusions, missing pieces, and the condition of the manholes and the manhole covers. The locations of all deficiencies found in the outfall pipe must be shown by distances with reference points agreed upon by the Contractor and the Engineer.
4.2. Continuous voice recording describing defects and features found.
4.3. A clear digital photo or video picture capture of all structural deficiencies found.
4.4. The dimensions of all major structural deficiencies found.
4.5. A copy of the outfall video survey in high quality electronic media. The video media must include the following information:

4.5.1. Voice Recording
4.5.2. Recording number
4.5.3. Inspection date
4.5.4. Current distance along outfall (counter meter)
4.5.5. Printed labels on video recording hard copy with location and date

4.6. Comparison of findings between the pre and post construction surveys.
4.7. Possible cost effective solutions to remedy the major structural deficiencies identified and the serviceability of the existing EBMUD outfall pipe.

Quality Control and Assurance

Qualifications: Experienced Contractor's personnel trained in identifying and locating defects, breaks, and obstacles must perform the EBMUD outfall pipe video inspection.

MATERIALS

Closed-Circuit Television (CCTV) Inspection Equipment

CCTV equipment must include:

1. CCTV color camera with articulating head that pans and rotates 360 degrees.
2. Transporter adapted for conditions of the pipe
3. Television monitor
4. Lighting
5. Cables and power sources

CCTV equipment must:

1. Be specifically designed and constructed for pipe inspection
2. Be operative in 100% humidity conditions
3. Have camera lighting that allows a clear view of the entire periphery
4. Have adjustable focal distance range from 150-mm to infinity
5. Produce a minimum 356 lines of resolution for camera and monitor
6. Have remote reading meter counter accurate to 1 percent over the length of the particular section being inspected

Calibration

Verify the accuracy of the distance meter used in CCTV inspection with a Rollatape measuring wheel or other suitable device approved by the Engineer.

Electronic Media

CCTV recording must be made in high quality electronic media such as Compact Disk (CD) or Digital Video Disk (DVD).

CONSTRUCTION

General

The Contractor must inspect the outfall pipe either by human entry or CCTV equipment.

When using CCTV equipment for inspection, the Contractor must provide a full 360-degree view video survey of the interior of the outfall pipe. The CCTV inspection rate must not exceed 9 m per minute.

When using human entry inspection, the Contractor must use a hand held video camera, lighting, voice recording and a digital photo camera to record the deficiencies in the outfall pipe. Lighting, video and picture quality must provide a clear, in focus view of the entire periphery of the outfall pipe, where possible, given water level conditions. Do not exceed the CCTV inspection rate of 9 m per minute.

To gain access, the Contractor must inform and coordinate with the Engineer and EBMUD (WPS) 20 working days in advance of the planned outfall pipe video survey. The Contractor must not perform the video survey work without the presence of an EBMUD representative.

The EBMUD outfall pipe can be accessed through manholes located within the State right of way between Stations E 84+20 (Rt.) and E 93+80 (Rt.). Opening manhole covers will require lifting padeyes, eyebolts and a crane or other lifting equipment.

A shutdown of EBMUD's outfall pipe must take place in order to restrict flow in the outfall pipe for the video survey to take place. The outfall pipe can only be shut down during dry weather conditions, low tide and from 1:00 a.m. to 5:00 a.m. Shutdowns are also limited by the status of treatment plant functions and weather conditions, current and forecasted. The Contractor must ensure that all work is complete and manhole covers are properly secured in place before 6:00 a.m.

A written System Outage Request (SOR) must be submitted to the Engineer 10 working days in advance of the planned video survey. The SOR must be approved by the Engineer before each video inspection survey.

The EBMUD outfall pipe is subject to zero load. Neither contractor's vehicles nor equipment are allowed to cross or be within 3.8 m from centerline of the EBMUD outfall pipe.

Video Survey Locations

The video survey must be conducted at the following location:

EBMUD 3250 mm RCP Outfall from Stations E 86+10 (Rt.) to E 89+20 (Rt.)

Safety Procedures

In addition to the requirements specified in this special provision, the Contractor must comply with all applicable Federal, State, and local safety and health requirements and standards.

Pre-entry and Confined Space Operations

Pre-entry and confined space operations must comply with the provisions of Article 108 of the General Industry Safety Orders, Section 1532 of the Construction Safety Orders of Title 8 of the California Code of Regulations, California Occupational Safety and Health Administration (CAL-OSHA) regulations, and the following requirements:

1. Testing for the existence of dangerous water and air contamination
2. Air ventilation requirements
3. Entry rate work within confined spaces

The Contractor must:

1. Provide air ventilation for the Contractor's personnel, and the Engineer as required by job conditions.
2. Provide personal protective equipment to Contractor's personnel, the Engineer, and EBMUD personnel as required by job conditions.
3. Coordinate lockout/tagout procedures with EBMUD as needed. The Contractor must be ready to apply locks and tags in conjunction with EBMUD during outfall pipe entry. The Contractor must be in constant contact with EBMUD and the Engineer during the duration of the outfall pipe shutdowns.
4. Provide safeguards, including traffic barriers, warning signs, barricades, temporary fences and other similar safeguards when required for the protection of all personnel during the outfall video survey.

Testing

Testing must take place for the following suspected conditions prior to entering the outfall pipe:

1. Combustible gases
2. Hydrogen sulfide (H2S)
3. Contaminated and infectious waste

Testing must take place for the following suspected conditions at all times during inspection:

1. Combustible gases
2. Hydrogen sulfide (H2S)
3. Oxygen deficiencies
4. Carbon dioxide
5. Carbon monoxide

PAYMENT

The contract lump sum price paid for sewer video survey includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in conducting the video survey, including preparing submittals, providing Pre and Post-Construction inspection reports, electronic media, inspection documentation, personal protective equipment, safety devices, testing, and cleaning as necessary to facilitate the video survey and inspection, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.41 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Attention is directed to "Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

The Contractor may encounter rock dike during footing construction at abutment E23R as shown on the plans. The Contractor shall remove and dispose of rock dike in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for removing existing rock dike for footing construction at abutment E23R shall be considered as included in the contract price paid per cubic meter for structure excavation of the types shown in the Engineer's Estimate and no separate payment will be made therefor.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 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.

The portion of imported borrow placed within 1.5 m of the finished grade shall have a Resistance (R-Value) of not less than 15.

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.

Imported borrow shall be mineral material including rock, sand, gravel, or earth. The Contractor shall not use man-made refuse in imported borrow including:

A. Portland cement concrete
B. Asphalt concrete
C. Hot mix asphalt
D. Material planed from roadway surfaces
E. Residue from grooving or grinding operations
F. Metal
G. Rubber
H. Mixed debris
I. Rubble

COMPACTION FOR DUCT BANK BACKFILL

Duct bank backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications. Backfill placed in duct bank trenches which are to be outside of slope lines and not under pavement shall be compacted to a relative compaction of not less than 90 percent. Backfill on slopes and in areas where pavement is to be constructed shall be compacted to a relative compaction of not less than 95 percent.

Pervious backfill material placed within the limits of payment for bridges will be measured and paid for as structure backfill (bridge).

If structure excavation or structure backfill for bridges is not otherwise designated by type and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be measured and paid for as structure excavation (bridge) or structure backfill (bridge), respectively.

10-1.42 HANDLING, TRANSPORTATION, AND DISPOSAL OF CONTAMINATED MATERIAL

GENERAL

Summary

This work includes temporary storage, confirmation sampling and analysis, transportation, and disposal of contaminated material.

Comply with Section 19, "Earthwork," of the Standard Specifications.

Test results used to determine the nature and extent of contaminated material are provided as described in "Supplemental Project Information," of these special provisions. Ensure that the age of the test results meet disposal facility requirements.

Definitions

Class II waste: Contaminated material that is not regulated as a hazardous waste but requires handling as a designated waste under Water Code § 13173. Designated as roadway excavation (Class II) or structure excavation (Class II). Does not include rock.

Resource Conservation and Recovery Act (RCRA): Federal law that provides guidelines for managing solid waste.

Non-RCRA hazardous waste: Contaminated material regulated as a hazardous waste under California law but not under RCRA. Also known as California hazardous waste. Designated as roadway excavation (Type H) or structure excavation (Type H). Does not include rock.

Submittals

Work Plan: At least 20 days before starting clearing and grubbing or earthwork at the job site, submit a work plan that includes:

1. Schedule of activities.
2. Method of excavation and equipment to be used.
3. Dust control procedures
4. Storage methods and locations for contaminated material.
5. Haul routes.
6. Spill contingency plan.

The Engineer reviews the work plan within 15 days. Resubmit required revisions within 5 days. Do not start clearing and grubbing or earthwork until the plan is approved by the Engineer. No adjustment for time or money is made if resubmittals of the work plan are required due to deficiencies in the plan.

Waste Disposal Documents: Submit a disposal facility waste disposal request for the Engineer's signature.

Before transporting hazardous waste, submit a copy of the transporter's valid hazardous waste transporter registration.

Submit completed waste shipment forms and disposal facility weight tickets within 35 days after shipment. The Department withholds payment until the completed forms are submitted.

Sampling and Analysis Plan: At least 20 days before starting material sampling, submit a sampling and analysis plan (SAP). The SAP must be signed by a California registered professional engineer or California registered professional geologist experienced in contaminated site characterization. The SAP must include:

1. Purpose and scope of the investigation, including:

    1.1. Additional disposal facility requirements
    1.2. Reclassification of material
    1.3. Characterization of material outside of the excavation pay limits

2. Sampling locations and methods
3. Analytical methods
4. Name, address, and Environmental Laboratory Accreditation Program certification number of the testing laboratory
5. Quality assurance/quality control procedures

Base the sampling and analysis procedures on guidelines in:

1. USEPA, SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods"
2. ASTM, D 1452, "Soil Investigation and Sampling by Auger Borings"
3. ASTM, D 1586, "Penetration Test and Split-Barrel Sampling of Soils"
4. ASTM, D 1587, "Thin-Walled Tube Sampling of Soils for Geotechnical Purposes"
5. ASTM, D 6282-98(2005), "Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations"

The Engineer reviews the SAP within 15 days. Resubmit required revisions within 5 days. Do not start sampling until the plan is approved by the Engineer. No adjustment for time or money will be made if resubmittals of the SAP are required due to deficiencies in the plan.

Quality Control and Assurance

Regulatory Requirements: Laws and regulations that govern this work include:

1. Health and Safety Code, Div 20, Ch 6.5 (California Hazardous Waste Control Act)
2. 22 CA Code of Regs, Div 4.5 (Environmental Health Standards for the Management of Hazardous Waste)
3. 8 CA Code of Regs
4. Water Code § 13173

Permits and Licenses: Obtain all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying hazardous waste, under Section 7-1.04, "Permits and Licenses," of the Standard Specifications.

For hazardous waste disposal, the Engineer obtains the Environmental Protection Agency generator identification number and Board of Equalization identification number and signs all manifests as the generator. Notify the Engineer at least 5 days before starting waste transport and at least 24 hours before subsequent loads when there is a break in hauling of more than 5 days.

CONSTRUCTION

Apply water to control dust at all times while performing clearing and grubbing or earthwork activities in work areas containing contaminated material. Apply water under Section 17, "Watering," of the Standard Specifications. Excavation, transportation, storage, and handling of contaminated material must result in no visible dust migration off the job site.

Prevent mixing of contaminated material with uncontaminated material. No additional payment is made for material requiring reclassification because of failure to segregate the material after excavation.

Characterization and disposal of additional material from excavations performed outside of the pay limits are included in the contract price for excavation. Assume the material has the same handling, transportation and disposal requirements as adjacent material. Furnish replacement material suitable for the planned use under Section 19, "Earthwork," of the Standard Specifications.

Temporary Storage

Transfer contaminated material directly from the excavation to any of the following:

1. Transport vehicles
2. Storage containers
3. Stockpile locations approved by the Engineer

Construct stockpile locations as follows:

1. The stockpiled material must not contain free liquids that separate readily.
2. Furnish and place undamaged chemically resistant geomembrane liners.

    2.1. Non-reinforced liner must be at least 0.5 mm thick.
    2.2. Scrim-reinforced liner must have a minimum weight of 20 kg/100 square meters.

3. Furnish and place undamaged geomembrane covers.

    3.1. Non-reinforced cover must be at least 0.25 mm thick.
    3.2. Scrim-reinforced cover must have a minimum weight of 13 kg/100 square meters.

4. The dimensions of the geomembrane must exceed the dimensions of the stockpile at all times.
5. Seal the seams in multiple geomembrane liners to prevent leakage.
6. Cover stockpiles at the end of each day or before storm events to prevent windblown dispersion and precipitation run-off and run-on.
7. If more than one sheet is required to cover the material, overlap the sheets a minimum of 450 mm.
8. Secure the cover to keep it in place. Do not use driven anchors except at the perimeter of the stockpile. Inspection and maintenance must comply with "Water Pollution Control" of these special provisions.

These stockpiling requirements apply to temporary storage outside of an excavation or a transport container including:

1. Staging of excavated material next to the excavation before pick up by loading equipment
2. Accumulating material for full transport loads
3. Awaiting test results required by a disposal facility

Start removing storage containers and stockpiles containing hazardous waste within 90 days of accumulating any quantity of material. After final removal has occurred, complete any cleanup required by the Engineer.

Sampling and Analysis

Test the material for any additional acceptance requirements requested by the disposal facility or for confirmation of classifications specified on the plans or in the special provisions. Use sampling and analysis procedures approved by the Engineer and the disposal facility. Prepare and submit a sampling and analysis plan before starting any tests.

The Engineer makes the final decision on reclassification or characterization of material after review of the test results. Allow 5 business days for review of test results. Changes in classification of materials will comply with Section 4-1.03, "Changes," of the Standard Specifications.

Transportation

Prepare a non-hazardous waste manifest or other shipping form for each load of Class II waste. Prepare a uniform hazardous waste manifest for each load of hazardous waste using the appropriate waste code. Transport hazardous waste using a transporter registered with the Department of Toxic Substances Control.

Cover the cargo during transport to prevent spillage or dust release. You agree to indemnify the State from any cost or liability due to spillage during transport of contaminated material to a disposal facility.

Disposal

Dispose of contaminated material as follows:

1. Roadway excavation (Class II) or structure excavation (Class II) – Haul and dispose of the material at a permitted Class II waste management facility.
2.. Roadway excavation (Type H) or structure excavation (Type H) – Haul and dispose of the material at a permitted non-RCRA hazardous waste management facility.

Obtain waste disposal approval from the appropriate disposal facility. Type H material from MN 89+95 to MN 95+95 is eligible for an exemption to the Board of Equalization disposal fees as provided under Health and Safety Code §§ 25174.1 and 25174.7. Request a letter of exemption from the Engineer at least 5 days before transporting Type H material from within these limits to a disposal facility.

MEASUREMENT AND PAYMENT

Quantities of roadway excavation and structure excavation, of the types shown in the Engineer's Estimate, will be measured in the same manner specified for roadway excavation and structure excavation in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for handling, transportation, and disposal of Class II waste is included in the contract price paid per cubic meter for roadway excavation (Class II) and structure excavation (Class II) and no additional compensation will be allowed therefor.

Full compensation for handling, transportation, and disposal of non-RCRA hazardous waste is included in the contract price paid per cubic meter for roadway excavation (Type H) and structure excavation (Type H) and no additional compensation will be allowed therefor.

The contract lump sum price paid for contaminated material sampling and analysis includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in confirmation sampling and analysis for disposal characterization, including preparation of a sampling and analysis plan, as specified in these special provisions and as directed by the Engineer.

10-1.43 IMPORTED BORROW (LIGHTWEIGHT AGGREGATE)

Imported borrow (lightweight aggregate) shall consist of furnishing, placing and compacting lightweight aggregate material at the locations and to the lines and grades designated on the plans or specified in the special provisions. Imported borrow (lightweight aggregate) shall conform to the requirements specified for embankment and structure backfill in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Lightweight aggregate material shall consist of a rotary kiln expanded shale aggregate of the extruded type or a processed, naturally-occurring volcanic aggregate.

Lightweight aggregate material shall be as specified in these special provisions.

Lightweight aggregate material, when deposited in place, shall conform to the following:

Grading Requirements

Sieve Sizes	Percentage Passing
37.5-mm	100
25-mm	95 - 100
19-mm	90 - 100
9.5-mm	15 - 85
75-µm	0 - 9

Grading will be determined in conformance with the requirements of California Test 202, except shaking in the sieves shall be limited to 5 minutes.

Quality Requirements

Test	Requirement
Resistance (R-Value)	50 min
Durability Index	35 min

Imported borrow (lightweight aggregate) shall have a maximum calculated saturated surface dry unit weight of 960 kg/m^3. The saturated surface dry unit weight shall be calculated by adjusting the dry loose unit weight, determined in conformance with the requirements of California Test Method 212, using test procedure (b) Compaction Method (by jigging), by the absorption of the coarse and fine fractions. The absorption shall be determined by California Test Methods 206 and 207, except that the samples shall be oven dry before soaking and shall be soaked for 24 hours plus or minus 30 minutes. To calculate the saturated surface dry unit weight: 1) multiply the percent coarse aggregate by the absorption of the coarse aggregate; 2) multiply the percent fine aggregate by the absorption of the fine aggregate; 3) add the two values from 1) and 2) and divide by 10000; 4) add one (1) to the result from 3) and multiply by the dry loose unit weight.

Imported borrow (lightweight aggregate) shall be placed and compacted to the designated dimensions as specified in Sections 19-1.03, "Grade Tolerance," and the requirements specified for embankment construction in Section 19-6, "Embankment Construction," of the Standard Specifications, except Section 19-5, "Compaction," of the Standard Specifications shall not apply.

Initial layers of imported borrow (lightweight aggregate) may be placed by end dumping from trucks, or by any other method approved by the Engineer.

Imported borrow (lightweight aggregate) shall be spread or placed in such manner that will prevent bulking of the material and minimize particle breakdown. Imported borrow (lightweight aggregate) shall be compacted in uniform layers of 0.2-m maximum thickness before compaction. Compaction shall be obtained by a minimum of 3 complete coverage passes using smooth drum steel roller compaction equipment imposing a minimum contact force of 1850 kg per-meter-width of the roller face. Track type equipment which imposes the equivalent contact pressure as that specified for steel drum rollers, as determined by the Engineer, may be used provided the 3 complete coverages of the tracks of the track type equipment are achieved. Sufficient moisture treatment shall be made to aid the compactive effort. Compaction using pneumatic-tired equipment or compaction within trenches or other limited-access areas, or compaction in areas of low confining pressure, shall be demonstrated by the Contractor and approved by the Engineer.

A test site using proposed lightweight aggregate material shall be constructed and compacted when alternative compaction equipment and methods of compaction (including use of pneumatic-tired equipment in trenches, in limited-access areas, and areas of low confining pressure) are proposed by the Contractor. The alternative compaction equipment and methods of compaction shall not be used until the alternative methods and equipment meet project and site conditions, as determined by the Engineer.

Quantities of imported borrow (lightweight aggregate) shall be paid for by the cubic meter calculated on the basis of the mass, measured in place in accordance with Section 9-1.01, “Measurement of Quantities,” of the Standard Specifications divided by the 95 percent of the dry unit weight measured in accordance with California Test Method 212, using test procedure (b) Compaction Method (by jigging).

The contract price paid per cubic meter for imported borrow (lightweight aggregate) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing imported borrow (lightweight aggregate), complete in place (including constructing and removing any test sites required), as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.44 LIGHTWEIGHT EMBANKMENT MATERIAL (CELLULAR CONCRETE)

This work shall consist of constructing a lightweight embankment material (cellular concrete) to the lines, grades, and dimensions shown on the plans, in accordance with the Standard Specifications, these special provisions and as directed by the Engineer.

The Contractor shall furnish a mix design which will produce a cast density (at point of placement) of 3.7 to 5.6 kN/m^3 with a minimum compressive strength of 551 kPa at 28 days. The Contractor shall provide the Engineer with a Work Plan, including the equipment and procedures proposed, including working drawings for form work for the lightweight embankment material (cellular concrete) showing work areas which shall be formed in segments such that they can be filled in less than 2 hours, at least 30 working days prior to placement. Items in the submittal shall include:

1. Material list of items; manufacturer's specifications for those items;
2. Mix design(s), including laboratory data using the mix design verifying mass and strength requirements.
3. Form work for the installation of the lightweight embankment material (cellular concrete), including permanent structure and temporary form systems, shall conform to the manufacturer's specifications.
   Form work shall be water tight and must be capable of supporting lateral loads of 3 times the calculated load of the lightweight embankment material (cellular concrete).
4. Working drawings for the form work shall conform to the provision in "Working Drawings," of these special provisions and be subject to the Engineer approval.

Admixtures for accelerating the set time may be used in accordance with the manufacturer's recommendations. A foaming agent shall be used and shall be tested in accordance with ASTM C 796. Mixing water shall be potable and free of deleterious amounts of acids, alkali, salts, oils, and organic materials which would adversely affect the setting or strength of the lightweight embankment material (cellular concrete).

Portland Cement shall comply with ASTM C150, Types I, II, or III. Pozzolans and other cementitious materials may be used when specifically approved by the manufacturer of the foaming agent.

A thickening agent may be added in the top 150 mm to obtain the desired tolerances.

At the point of placement, the density shall be in accordance with the specified cast density. A single cast density test shall represent the lesser of 300 cubic meters or one day's production.

The compressive strength shall be tested in accordance with ASTM C 495 except as follows:

1. Unless otherwise approved by the Engineer, the specimens shall be 76.2 mm by 152.4 mm cylinders. During molding, the Contractor shall place the cellular concrete in two approximately equal layers; no rodding shall be allowed. Specimens shall be covered and protected immediately after casting to prevent damage and loss of moisture.
2. Specimens shall be moist cured in the molds prior to the 28-day compressive strength test. Specimens shall not be oven dried.

Lightweight embankment material (cellular concrete) shall be placed to the designated dimensions and grades as shown on the plans. Grades as shown on the plans may vary by 100 mm over 3 m in length, in any direction. Any areas outside this tolerance shall be ground down or filled in as needed and directed by the Engineer.

Lift thickness for lightweight embankment material (cellular concrete) shall not exceed 1.2 m. After curing for 12 hours, any crumbling area on the surface should be removed. Surface stepping shall be limited to 150 mm.

A minimum 12-hour waiting time between lifts shall be required. The minimum waiting time may be reduced subject to the approval of the Engineer. If ambient temperatures are anticipated to be below 4.5 °C within 24 hours after placement, the mixing water should be heated when specifically approved by the manufacturer of the foaming agent, or placement shall be prohibited during such period. Placement shall not be allowed on frozen ground.

Lightweight embankment material (cellular concrete) shall be job site batched, mixed with the foaming agent, and placed with specialized equipment certified by the manufacturer. Slurry coats and multilayer casting are acceptable methods of installation. Subgrade to receive lightweight embankment material (cellular concrete) shall be free of all loose and extraneous material. Subgrade shall be uniformly moist, and any excess water standing on the surface shall be removed prior to placing lightweight embankment material (cellular concrete).

MEASUREMENT AND PAYMENT

Pay quantities for lightweight embankment material (cellular concrete) will be measured by the cubic meter, to the lines and grade shown on the plans and as directed by the Engineer.

The contract price paid per cubic meter for lightweight embankment material (cellular concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing the lightweight embankment material (cellular concrete), 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 providing the work plan including the form work involved in placing the lightweight embankment material (cellular concrete) shall be considered as included in the contract price paid per cubic meter for lightweight embankment material (cellular concrete) and no separate payment will be made therefor.

10-1.45 SUBGRADE ENHANCEMENT GEOTEXTILE

GENERAL

Summary

This work includes placing subgrade enhancement geotextile (SEG) between the subgrade and structural section.

Submittals

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

MATERIALS

SEG must consist of either of the following:

1. Polyester
2. Polypropylene

SEG must comply with:

Subgrade Enhancement Geotextile

Property	ASTM	Specification [a]				
		Class A1	Class A2	Class B1	Class B2	Class B3
Elongation at break, %	D 4632	<50	≥50	<50	<50	≥50
Grab tensile strength, kN minimum	D4632	1.10	0.70	--	1.40	0.90
Wide width tensile strength at 5% strain, kN/m minimum	D 4595	--	--	29	--	--
Wide width tensile strength at ultimate strength, kN/m minimum	D 4595	--	--	70	--	--
Tear strength, kN minimum	D 4533	0.40	0.25	--	0.50	0.35
Puncture strength, kN minimum	D 6241	2.20	1.38	2.75	2.75	1.92
Permittivity, sec^{-1} minimum	D 4491	0.05	0.05	0.20	0.20	0.20
Apparent opening size, mm maximum	D 4751	0.30	0.30	0.60	0.30	0.30
Ultraviolet stability (retained strength after 500 hrs exposure), % minimum	D 4355	70	70	70	70	70

Notes:
[a] Specifications are based on minimum average roll value in the weaker principle direction except apparent opening size is based on maximum average roll value.

SEG must be furnished in a cover capable of protecting it from ultraviolet radiation and abrasion due to shipping and handling, and shall remain in the cover until installation.

SEG must be Class B1.

CONSTRUCTION

Do not use SEG made with polyester within 100 mm of recycled concrete.

Before placement, remove loose or extraneous material and sharp objects that may come in contact with SEG.

Place SEG:

1. In compliance with the manufacturer's recommendations
2. Without wrinkles

Overlap adjacent borders of rolls at least 610 mm. Overlap the ends of rolls at least 610 mm in the direction you spread the material covering SEG.

You may fold or cut SEG to conform to curves. If you cut, overlap at least 450 mm. Hold the overlap in place, choosing from:

1. Staples
2. Pins
3. Piles of material to be placed on the SEG

Do not:

1. Stockpile material on SEG
2. Operate equipment or vehicles directly on SEG
3. Place more SEG than can be covered in 72 hours
4. Compact with a sheepsfoot or other non-smooth roller
5. Turn vehicles on material placed directly over SEG

Repair or replace damaged SEG. Repairing consists of placing new SEG with at least one meter of overlap from the edges of the damaged area.

10-1.46 EROSION CONTROL (NETTING)

Erosion control (netting) shall conform with the details as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Erosion control (netting) work shall consist of furnishing, installing, and maintaining erosion control (netting) in ditches or swales, on embankment slopes, excavation slopes and other locations as shown on the plans.

Following the installation of erosion control (netting), erosion control materials shall be applied onto the netting face as specified in "Erosion Control (Type D)," of these special provisions.

MATERIALS

Materials for the erosion control (netting) shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Erosion Control Netting

Erosion control netting shall consist of 100 percent spun coir fiber and shall conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 3776	400
Minimum Tensile Strength, kilonewtons, ASTM Designation: D 4595	9.0 to 11.3 kN/m in longitudinal direction (dry) 5.0 to 10.7 kN/m in cross-direction (dry) 6.0 to 9.8 kN/m in longitudinal direction (wet) 4.0 to 9.4 kN/m in cross- direction (wet)
Roll Width, meters, min.	4
Area/Roll, square meters, min.	200
Open Area, percent	63-70

Staples

Staples shall be as shown on the plans.

INSTALLATION

Erosion control (netting) shall be installed in ditches or swales, on embankment slopes, or excavation slopes as follows:

A. Erosion control (netting) strips shall be placed loosely along the ditch or swale with the longitudinal edges and joints parallel to the centerline of the ditch or swale. Longitudinal joints of netting shall be overlapped and stapled. Transverse joints of netting shall be secured in intermediate joint trenches. Staples shall be driven perpendicular to the slopes. Ends of the netting shall be secured in place in key trenches.
B. Erosion control (netting) strips shall be placed loosely on the embankment or excavation slope with the longitudinal joints perpendicular to the slope contour lines. Longitudinal and transverse joints of netting shall be overlapped and stapled. Staples shall be driven perpendicular to the slopes. Ends of the netting shall be secured in place in key trenches.

MAINTENANCE

Damaged netting shall be replaced on the same day the damage occurs. Washouts between joints or beneath the netting shall be repaired on the same day damaged occurs. Erosion control (netting) damaged by the Contractor's vehicles, equipment, or operations shall be replaced or repaired by the Contractor at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of erosion control (netting) will be measured by the square meter as determined from actual slope measurements of the areas covered by the erosion control (netting) excluding overlaps.

The contract price paid per square meter for erosion control (netting) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing erosion control (netting), complete in place, including trench excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.47 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), 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) 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), 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).

10-1.48 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 Mix 1

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lotus purshianus (Purshings Lotus)	50	4
Lupinus bicolor (Pygmy-Leaf Lupine	50	8
Hordeum californicum (California Barley)	40	8
Bromus carinatus * (California Brome)	40	8
Festuca rubra 'Molate' * (Molate Red Fescue)	40	8
Nassella pulchra * (Purple Needlegrass)	40	10
Vulpia microstachys (Three Weeks Fescue)	40	6
	TOTAL	52

*Seed produced in California only.

Seed Mix 2

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Agrostis pallens (Thingrass)	40	8
Carex praegracilis* (California Field Sedge)	30	4
Festuca idahoensis (Idahoe Fescue)	40	16
Festuca rubra 'Molate'* (Molate Red Fescue)	40	24
Juncus effusus (Common Rush)	40	2
Poa secunda* (Pine Bluegrass)	50	8
	TOTAL	62

*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

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 contaminates. 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 one of the following mixtures with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Seed Mix 1	52
Fiber	320

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	8

Material	Kilograms Per Hectare (Slope Measurement)
Seed Mix 2	62
Fiber	320

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	8

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:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	320
Stabilizing Emulsion (Solids)	140

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	8

The ratio of total water to total stabilizing emulsion in the mixture must be as recommended by the manufacturer.

Hydraulic application of materials for erosion control (netting) areas shall be applied by hose, from the ground. Erosion control (Type D) materials shall be applied onto the slope face such that the materials are well integrated into the erosion control (netting) and in contact with ground surface. Application shall be perpendicular to the slope face such that erosion control (netting) materials are not damaged or displaced. Erosion control (netting) damaged by the Contractor's operations shall be replaced by the Contractor at the Contractor's expense.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.

10-1.49 COMPOST (INCORPORATE)

This work includes incorporating compost into the surface of areas 1:4 (vertical:horizontal) or flatter where 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 .5 hectare 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 contaminates. 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.

1. Apply compost to a depth of 150 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 150 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 (Type D, Seed Mix 2) 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.

10-1.50 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.

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 biodegradable jute, sisal, or coir fiber netting. 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 minimun 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 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 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 shall be placed as shown on the plans.
3. 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.
4. Fiber rolls shall be installed approximately parallel to the slope contour.
5. Fiber rolls shall be installed before the application of Erosion Control (Type D) 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.

10-1.51 ROCK BLANKET

Rock blanket shall be placed as shown on the plans and in conformance with these special provisions.

MATERIALS

Rock

Rock for the rock blanket shall be clean, smooth rock obtained from a single source.

Rock shall conform to the following grading:

Screen Size (Millimeters)	Percentage Passing (By Mass)
355	100
254	90-100
200	0-10

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

Filter Fabric

Geosynthetics used for filter fabric must be permeable and nonwoven. Filter fabric must consist of one of the following:

1. Polyester
2. Polypropylene
3. Combined polyester and polypropylene

Filter fabric must be Class A and comply with the following:

Filter Fabric

Property	ASTM	Specification		
		Class A	Class B	Class C
Grab breaking load, 25 mm grip, kilonewtons minimum in each direction	D 4632	0.69		
Apparent elongation, percent minimum in each direction	D 4632	50		
Hydraulic bursting strength, kilopascal (kPa) minimum	D 3786	1448		
Ultraviolet resistance, percent minimum retained grab breaking load, 500 hr	D 4355	70		
Permittivity, sec^{-1} minimum	D 4491	0.5	0.2	0.1
Apparent opening size, average roll value, Metric sieve size,µm maximum	D 4751	425	250	212

SITE PREPARATION

Prior to beginning rock blanket work, areas to receive the rock blanket shall be cleared in conformance with the provisions in "Roadside Clearing" of these special provisions.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum relative compaction of 90 percent.

PLACEMENT

Prior to placing filter fabric, surfaces shall be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation.

Align and place fabric in a wrinkle-free manner.

Overlap adjacent rolls of the fabric between 300 mm to 450 mm. The preceding roll shall overlap the following roll in the direction the material is being spread. Fasten fabric with staples or stakes flush with the fabric to prevent movement of fabric by placement of rock blanket.

Repair or replace fabric damaged during placement of rock blanket with sufficient fabric to comply with overlap requirements.

Damage to the fabric resulting from the Contractor's vehicles, equipment or operations shall be replaced or repaired by the Contractor at the Contractor's expense.

Rock shall be placed loosely over filter fabric to the depth as shown on the plans. Rock blanket shall not be placed to within 3 m of ground cover areas and other plants.

MEASUREMENT AND PAYMENT

Rock blanket will be measured by the square meter as determined from actual measurements made parallel to the ground slope.

The contract price paid per square meter for rock blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.52 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 alternate conduits and, at the option of the Contractor, shall be one of the following:

A. Corrugated high density polyethylene (CHDPE) pipe conforming 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 for CHDPE pipe 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.

10-1.53 IRRIGATION SLEEVE

Irrigation sleeves shall be polyvinyl chloride (PVC) plastic pipe and shall conform to the provisions in Section 20-2.15B(1), "Plastic Pipe Supply Line," of the Standard Specifications and these special provisions.

Irrigation sleeves less than 150 mm in diameter shall have a pressure rating (PR) 315.

Irrigation sleeves 150 mm or larger in diameter shall be Schedule 40.

Fittings shall be Schedule 40.

Irrigation sleeves shall be installed where shown on the plans.

Irrigation sleeves shall be installed not less than 0.45-m below finished grade measured to the top of the sleeve. Sleeves shall extend 150 mm beyond paving. The ends of the sleeve shall be capped until use.

Quantities of irrigation sleeve to be paid for will be determined from the slope length designated by the Engineer. Irrigation sleeve placed in excess of the lengths designated will not be paid for.

The contract price paid per meter for 150 mm Plastic Pipe (schedule 40) irrigation sleeve shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in irrigation sleeve, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.54 UTILITY LINE (BRIDGE)

Utility lines identified on the plans as water line, sewer line,and air line shall be of the size shown and shall conform to the details shown on the plans, the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, and these special provisions.

GENERAL

Unless otherwise shown on the project plans, lines shall be extended 1.5 meters beyond the pier or abutment footings.

Working Drawings

The Contractor shall submit complete working drawings for the installation of the utility lines to the Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

The working drawings shall be supplemented by the manufacturer's descriptive data, performance data, and installation instructions for the following:

A. Pipe
B. Fittings
C. Wrapping tape
D. Mechanical couplings
E. Valves
F. Supports
G. Ball joints
H. Expansion loops
I. Casing insulators
J. End seals
K. Pipe seals
L. Automatic drain
M. Flexible and seismic expansion assembly, sliding expansion joint
N. The data for the expansion assembly shall include the preset dimension for each expansion assembly installation.

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 OSD for final approval and use during construction.

MATERIALS

Pipe and Fittings for Utility Lines

Pipes and fittings for supply lines shall be of the type shown on the plans.

Ductile iron pipe shall be restrained push-on joint pipe conforming to the requirements in ANSI/AWWA C151/A21.51. At expansion joint connection, ductile iron pipe shall have a factory installed flange on one end compatible with the expansion joint connection, and the other end shall be compatible with the restrained push-on joint pipe or flange for a continuous connection. Ductile iron pipe shall be furnished in full 5.5 m lengths.

Restrained push-on joints for ductile iron pipe shall conform to the requirements in ANSI/AWWA C111/A21.11. The joints shall be boltless, non-compression, non-threaded with synthetic rubber gasket seals and have a positive locking device to keep the connection from separating. The joints shall be designed for a working pressure of 2.4 MPa and shall be capable of deflecting after assembly.

Fittings and flanges for ductile iron pipe shall conform to the requirements in ANSI/AWWA C110/A21.10 except for the manufacturer's proprietary design dimensions for restrained push-on joint pipe.

Ductile iron pipe and fittings shall have cement mortar lining and seal coating conforming to the requirements in ANSI/AWWA C104/A21.4. Pipe shall have a bituminous outside coating conforming to the requirements in ANSI/AWWA C151/A21.51, and fittings shall have a bituminous outside coating conforming to the requirements in ANSI/AWWA C110/A21.10.

Galvanized Steel Pipe shall conform to the requirements of Section 74-2.04, Pipes, joints and fittings of the standard specifications. For pipe sizes 100 mm or greater the pipe ends shall be grooved and mechanical couplings shall be used. For galvanized steel pipe less than 100 mm threaded ends and fittings shall be used. Welded steel pipe shall be standard weight ASTM designation A-53. Epoxy coated steel pipe shall be standard weight ASTM designation A-53 pipe.

Pipe shall be lined and coated with fusion bonded epoxy resin.

The lining and coating material shall be a one part, heat curable, thermosetting, fusion bonded, dry powder epoxy resin.

The resin shall be applied by the fluidized bed method.

The thickness of the lining or coating shall be not less than 15 mils or greater than 25 mils. Fittings shall be heated and cured in accordance with the manufactures specifications.

All surface irregularities, welds and weld splatter shall be ground smooth. All surfaces shall be blasted to white metal.

The lining and coating shall be pinhole free and tested with a low voltage wet sponge holiday detector. All pinholes shall be marked, repaired and retested to insure a pinhole free film.. The mechanical couplings shall be epoxy coated to match the pipe.

Branch Saddle

Branch saddle shall be rated for a pressure of 3445 kPa and shall be manufactured of ductile iron with stainless steel bands.

Supports

All supports shall be made from standard components. Shop drawings shall be submitted for all supports and support components that include the load rating, details and any necessary calculations. All metal parts shall be hot dip galvanized after fabrication. Fasteners shall be stainless steel unless shown otherwise on the plans.

Pipe wrapping tape and primer

Pipe wrapping tape shall be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 0.50 mm. Wrapping tape shall be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer shall be compatible with the pipe wrapping tape used. All steel pipe in contact with the ground except for epoxy coated pipe shall be wrapped.

Mechanical Coupling

Mechanical couplings shall be galvanized iron body, 2-piece type with zinc electroplated bolts. The coupling shall allow 6.4 mm end separation and a minimum of 1 degree of angular deflection. The couplings shall have a minimum pressure rating of 5500 kPa. Ridgid couplings and flange adaptors shall match the mechanical couplings except that the pressure rating for the flange adaptors and rigid couplings shall be a minimum of 2000 kPa.

Ball joint

Ball valve shall be carbon steel body, ductile iron seal with 150 lb. flanged connections. The ball joint shall have a minimum pressure rating of 10,000 kPa. The joint shall allow for a movement of 15 degrees.

Gate valve (65 mm and smaller)

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Gate valve (75 mm and larger, above ground)

Gate valve (75 mm and larger, above ground) shall be iron body with bronze trim, removable bonnet and non-rising stem, class 125 and same size as pipe in which installed. Gate valve shall be Crane, 461; Nibco Scott, F-619; Jenkins, 326; or equal.

Gate valve (75 mm and larger, below ground)

Gate valve (75 mm and larger, below ground) shall be AWWA double disc, hub or rubber ring type, removable bonnet and non-rising stem, equipped with operating nuts, 1380 kPa working pressure, and Tee handle wrench for each valve. Valve shall be Mueller, A-2380; American Valve, Model 28; or equal.

Ball valve

Ball valve shall be two piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

Butterfly valve

Butterfly valve shall be lug type with an iron body, bronze disc, buna N seal, stainless steel stem and pressure rating of 1378 kPa. The valve shall include a manual screw operator with a waterproof housing, bronze operating nut, and hand wheel.

Expansion Loop

Expansion loop shall be a pre-manufactured item consisting of a flanged connection, Schedule 40 pipe and stainless steel hose and braid. The unit shall be single or double braided as required to obtain a minimum pressure rating of 1137 kPa. The unit shall provide 100 mm or 38 mm of movement to match what is specified on the plans. A connection for a rod hanger shall be included at the middle of the loop.

Air Release valve.

Valve shall be cast iron body with stainless steel float, linkage, needle and float. The valve shall be a compound leaver type with a rating of 1034 kPa. The valve for the sewer line shall be rated for sewage use and shall include a blow off valve.

Automatic drain

The drain shall be iron body with a stainless steel float. The valve shall have a pressure rating of 1034 kPa.

Casing Insulators

Casing insulators shall be designed for the size of casing and utility line shown on the plans. Casing insulators shall be a 203-mm wide unit consisting of 1.8-mm thick, painted or galvanized, steel band and a minimum of four 50-mm wide glass reinforced runners. The casing insulators shall have a non-conductive inner liner. Insulators 152 mm or larger shall be coated with 0.25-mm thick coating of heat fused polyvinyl chloride. Casing insulators shall be factory constructed to ensure the utility is centered in the casing to avoid any pipe to pipe contact and shall have at least 2 runners seated on the bottom of the casing.

Dirt Stops for Supply Line NPS 4 or Greater

Dirt stops for utility lines of NPS 4 or greater shall consist of a redwood cover and foam filling the end void between the supply line and the end of the casing. The redwood cover shall be made with 50-mm thick construction grade redwood and cut to fit the supply line. The foam shall be commercially available polyurethane foam spray.

Mechanical Seal

The mechanical seal shall consist of a series of rubber seals with nut and bolt expansion tightness linked together.

Flexible and Seismic Expansion Assembly/sliding expansion Joint

Expansion assembly for mechanical utilities shall consist of a sleeve type expansion joint and an integral ball joint at each end with insulated flange connections to utility line. Expansion joint shall be manufactured of ductile iron and conform to the requirements in ANSI/AWWA C153/A21.53. Expansion joint shall be rated for a minimum of 2.4 MPa. Seismic expansion assembly shall be capable of deflecting and expanding simultaneously to an amount of not less than 15-degree angular deflection at each end of the unit and a total axial movement as shown on the plans**.**

Seal gasket for sleeve expansion shall be retained in the grooved outer casing with a leak proof design for 2.4 MPa working pressure. The expansion sleeve shall have a limiting stop collar to keep the sleeve from separating. The ball joints for the expansion assembly shall be contained in flanged retainers with seal gaskets that shall conform to the specifications.

Expansion joint shall be lined with a minimum of 0.38-mm of fusion bonded epoxy conforming to the requirements in ANSI/AWWA C213 and shall be holiday tested with a 1500 V spark test conforming to the requirements in ANSI/AWWA C213. The sliding expansion joint shall be similar to the flexible expansion joint except that it does not include the ball joints at each end.

Casing

Casing shall be welded Schedule 40, ASTM A-53 galvanized steel pipe with grooved ends.

Pipe Hanger Assembly

Pipe hanger assemblies shall consist of a concrete clevis plate or embedded steel welded linked eye rods, an adjustable steel yoke, a cast iron pipe roller, a steel roller rod and hex nuts. Parts shall be galvanized. The pipe hanger assembly shall be suitable for the type and size of pipe installed and shall be as shown on the plans.

Steel hangers, anchor bolts, pipe clamps, nuts and bolts, and other fittings shall be suitable for the type and size of the utility lines or casing and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Embed Plate

Bridge deck embed plate for pipe hangers and supports, as shown on the plans, shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Embed plates shall conform to the requirements in ASTM Designation: A 36. Embed plates shall be hot dip galvanized after fabrication.

Embed studs shall be manufactured from material conforming to the requirements in ASTM Designation: A 108 and shall be welded in conformance with " Welding," of these special provisions.

Lateral Restraint Assembly for Supply Line NPS 4 or Greater

Lateral restraint assembly for utility lines of NPS 4 or greater shall be adjustable and capable of resisting a horizontal force of 10 percent of the contributory dead load to the lateral restraint assembly. The lateral restraint assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Epoxy Adhesive

Epoxy adhesive shall conform to the provisions in Section 95-1, "General," of the Standard Specifications and at the option of the Contractor, shall conform to the provisions in Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," or in Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers," or in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications.

INSTALLATION

Mechanical utilities shall be supported as shown on the plans and in conformance with these special provisions.

Openings for supply lines through bridge superstructure concrete shall either be formed or shall consist of pipe sleeves.

Ductile iron pipe shall be connected and fully extended (pulled out) at the joint before the next connection is made.

Cleaning and Closing of Pipe

The interior of the pipe shall be cleaned before installation. Openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Wrapping and Coating Pipe

Damaged coating on utility line pipe in contact with the earth shall be wrapped with tape as follows:

A. Pipe to be wrapped shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
B. Tapes shall be tightly applied with one-half uniform lap, free from wrinkles and voids to provide not less than 2.5 mm thickness.
C. Field joints and fittings for wrapped pipe shall be covered by double wrapping 1.27 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over adjacent pipe coverings. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so that the tape will conform closely to the contours of the joint.

Where a casing passes through the abutment wall, the casing shall be wrapped with an additional 2 layers of asphalt-felt building paper conforming to the requirements in ASTM Designation: D 226, Type I, securely taped or wired in place.

TESTING

Mechanical utilities shall be tested in conformance with the provisions in Section 20-5.03H(1), "Method A," of the Standard Specifications, except that the testing period shall be 4 hours minimum with no leakage or pressure drop.

The Contractor shall furnish pipe anchorages to resist thrust forces occurring during testing. Leaks shall be repaired and defective materials shall be replaced by the Contractor at the Contractor's expense.

Pressure testing and necessary repairing of water lines shall be completed prior to backfilling, placing deck slabs over supply lines in box girder cells or otherwise covering the supply lines.

Each end of water line shall be capped prior to and after the testing.

The lines shall be tested as one unit.

MEASUREMENT AND PAYMENT

Measurement and payment for utility line (bridge) for each size listed in the Engineer's Estimate shall be made in the same manner as galvanized steel pipe and plastic pipe supply lines in Section 20-5.04, "Measurement," and Section 20-5.05, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing pipe, valves, couplings, joints, pipe hangers and supports, embed plates, steel brackets and other fittings, casing and casing insulators, dirt stops, mechanical seal, pipe wrapping tape, expansion loops, flexible and seismic expansion assemblies, for cleaning, closing, wrapping, coating pipe, and for pressure testing , concrete thrust blocks, epoxy adhesives, and trenching shall be considered as included in the contract prices paid per meter for the sizes of utility lines involved and no additional compensation will be allowed therefore.

10-1.55 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.

Aggregate may include processed glass. Place aggregate base with glass only where the material is to be permanently covered.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

10-1.56 HOT MIX ASPHALT

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Quality Control/Quality Assurance process.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submittals

Quality Control / Quality Assurance Projects

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results
2. California Test 371 tensile strength ratio results for untreated HMA
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and each 5000 tonnes, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

    7.1 For recovered material, 12.5 mm
    7.2 For unstabilized material, 25 mm

8. Location including:

    8.1. County
    8.2. Route
    8.3. Post mile
    8.4. Lane number
    8.5. Lane direction
    8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Quality Control and Assurance

Quality Control / Quality Assurance Projects

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 [a]	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:
[a] If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5000 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A must be _PG 64-10.

Aggregate

Specified Total Thickness Range	Grading
25 mm – 35 mm	9.5-mm
35 mm – 60 mm	12.5-mm
60 mm and above	19-mm

The aggregate for HMA Type A must comply with the 19 mm grading for the new mainline pavement, the maintenance road, and the parking lot; and with the 12.5 mm grading for the overlay section.

CONSTRUCTION

Rumble Strips

Construct rumble strips in the top layer of new HMA surfacing.

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Place HMA on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of HMA layers on adjacent lanes is between 1.5 m and 3.0 m. Place additional HMA along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA to form temporary conforms. You may place Kraft paper or another approved bond breaker under the conform tapers to facilitate the taper removal when paving operations resume.

Widening

If widening existing pavement, construct new structural section on both sides of the existing pavement to match the elevation of the existing pavement's edge for the project's entire length before placing HMA over the existing pavement.

If widening existing pavement, construct new structural section to match the elevation of the existing pavement's edge at each location before placing HMA over the existing pavement.

Conform Tapers

Place additional HMA along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

1. At the beginning, end, and every 800 m within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

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

10-1.57 HOT MIX ASPHALT OPEN GRADED FRICTION COURSE

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) open graded friction course (OGFC) using the Standard process.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submittals

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

    7.1 For recovered material, 12.5 mm
    7.2 For unstabilized material, 25 mm

8. Location including:

    8.1. County
    8.2. Route
    8.3. Post mile
    8.4. Lane number
    8.5. Lane direction
    8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Quality Control and Assurance

Do not test OGFC for plasticity index and tensile strength ratio.

MATERIALS

The grade of asphalt binder mixed with aggregate for OGFC must be PG 58-34 PM.

The aggregate for OGFC must comply with the 12.5 mm grading.
Treat OGFC aggregate with the same antistrip treatment used for HMA Type A.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Place OGFC on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of OGFC layers on adjacent lanes is between 1.5 m and 3 m. Place additional OGFC along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional OGFC to form temporary conforms. You may place Kraft paper, or another approved bond breaker, under the conform tapers to facilitate the taper removal when paving operations resume.

Conform Tapers

Place additional OGFC along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional OGFC to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

1. At the beginning, end, and every 800 m within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

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

10-1.58 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA Type A with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate mass
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Approved lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate mass
11. Calculated difference between the approved lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

Your quality control plan (QCP) must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1 000 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note:
During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate mass. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat RAP.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by mass. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry virgin aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

You may reduce the combined aggregate lime ratio for open graded friction course to between 0.5 and 1.0 percent.

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before adding RAP.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by mass in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for treating aggregates with lime slurry shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.59 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type A with dry lime.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

If marination is required, submit in writing the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit in writing a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate mass
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated
10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate mass
12. Calculated difference between the approved lime ratio and the actual lime ratio

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

If marination is required, the quality control plan (QCP) specified in Section 39-4, "Quality Control / Quality Assurance," must include aggregate quality control sampling and testing during lime treatment. Perform sampling and testing in compliance with:

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1 000 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

MATERIALS

Lime must be high-calcium hydrated lime. Lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer in writing at least 24 hours before the start of aggregate treatment.

Do not treat RAP.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat aggregate and stockpile for marination only once.
3. Treat aggregate separate from HMA production.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry virgin aggregate expressed as a percent. Water content of untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

You may reduce the combined aggregate lime ratio for open graded friction course to between 0.5 and 1.0 percent.

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before adding of RAP.

Proportion dry lime by mass with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate mass after any additional water is added to the mixture. The controller must determine the amount of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag house dust system. Material collected in the dust system must be returned to the mix.

Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate. Store dry lime in a uniform and free flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles between 24 hours and 60 days before using in HMA. Do not use aggregate marinated more than 60 days.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

MEASUREMENT AND PAYMENT

Full compensation for dry lime treating HMA aggregate including marination shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.60 LIQUID ANTISTRIP TREATMENT

GENERAL

Summary

This work includes treating asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in hot mix asphalt (HMA).

Submittals

For LAS, submit with the proposed job mix formula (JMF) submittal under Section 39, "Hot Mix Asphalt," of the Standard Specifications:

1. Materials Safety Data Sheet (MSDS)
2. One 1/2-L sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and a MSDS for each LAS lot.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each LAS shipment. With each certificate also submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity
5. Refinery
6. Consignee
7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment Date

Submit proportions for LAS as part of the JMF submittal specified in Section 39-1.03, "Hot Mix Asphalt Mix Design Requirements," of the Standard Specifications. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/4-L sample to the Transportation Laboratory. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with one separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch Mixing:

    1.1. Production date
    1.2. Time of batch completion
    1.3. Mix size and type
    1.4. Each ingredient's mass
    1.5. Asphalt binder content as percentage of dry aggregate mass
    1.6. LAS content as percentage of asphalt binder mass

2. Continuous Mixing:

    2.1. Production date
    2.2. Data capture time
    2.3. Mix size and type
    2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
    2.5. Aggregate moisture content as percentage of dry aggregate mass
    2.6. Flow rate of asphalt binder collected from the asphalt binder meter
    2.7. Flow rate of LAS collected from the LAS meter
    2.8. Asphalt binder content as percentage of dry aggregate mass calculated from:

        2.8.1. Aggregate weigh belt output
        2.8.2. Aggregate moisture input
        2.8.3. Asphalt binder meter output

    2.9. LAS content as percentage of asphalt binder mass calculated from:

        2.9.1. Asphalt binder meter output
        2.9.2. LAS meter output

Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit data
2. Submit incomplete, untimely, or incorrectly formatted data
3. Do not take corrective actions
4. Take late or unsuccessful corrective actions
5. Do not stop production when proportioning tolerances are exceeded
6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

MATERIALS

LAS-treated asphalt binder must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications. LAS does not substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's recommendations.

CONSTRUCTION

LAS must be between 0.5 and 1.0 percent by mass of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS mass is more than ±1 percent of the approved mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS mass is more than ±2 percent of the approved mix design LAS weight, stop production. If the LAS mass exceeds 1.2 percent of the asphalt binder mass, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the plant controller or a computer's memory at the plant.

MEASUREMENT AND PAYMENT

Full compensation for LAS is included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.61 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Concrete for cast-in-place concrete piling shall be prequalified in conformance with the provisions in Section 90-9, “Compressive Strength,” of the Standard Specifications.

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 "Supplemental Project Information," "Precast Concrete Quality Control," and "Welding" of these special provisions.

Attention is directed to "Order of Work", "Permits, Licenses, Agreements, and Certifications," of these special provisions regarding permit restrictions and regulations that may impact pile installation.

Soil samples are available for viewing. Contact the Toll Bridge Duty Senior at the office of the Toll Bridge Duty Senior at the District 4 Office, 111 Grand Avenue, Oakland, CA 94612, email: duty_senior_tollbridge_district04@dot.ca.gov, telephone (510) 286-5549.

The requirements in Section 49-1.03, "Determination of Length," of the Standard Specifications shall not apply.

Driven piling shall be installed and shall be of such length as required to obtain the specified pile tip elevation and to extend into the pile cap, as shown on the plans.

All piles shall be clearly marked along their entire length in increments of 250 mm with more prominent markings every meter. Marking shall be made by white paint lines 50 mm wide. Markings shall be accurately placed on the pile with a tape measure that is at least 30 meters in length such that the intended measurement is true at the bottom of the marking. Markings shall be visible from all directions and shall indicate cumulative length from the pile toe.

Pile installation procedure shall consider the presence of soft bay mud overlying dense soils, compressible bay mud, soft soils that allow piles to penetrate significant distances under self weight and the weight of the hammer, dense soils that result in hard driving, soils that gain strength during delays in driving, caving soils, hazardous and contaminated materials, serpentine materials, tidal flow fluctuation, high ground water, cobbles and boulders, subsurface debris, buried rock dike, existing foundation, wind excitation, underground utilities, sound control, vibration monitoring and traffic control.

At foundations where existing rock dike is indicated on the plans, probe pile locations prior to pile driving a minimum of 3m below bottom of footing to determine the extent of existing rock dike.

When a calculated nominal driving resistance is shown on the plans for piling, that value shall be utilized in lieu of nominal resistance in Section 49, "Piling," of the Standard Specifications, and these special provisions.

DRIVING EQUIPMENT

Drop hammers and vibratory hammers shall not be used to install driven piles.

Pile impact hammers for precast prestressed concrete piles shall conform to the following requirements:

A. Pile impact hammer shall have the following minimum hammer and system efficiencies:

Hammer Type	Minimum Hammer Efficiency (%)	Minimum System Efficiency (%)
Air/Steam	65	35
Hydraulic	90	50
Diesel	55	25

B. The pile hammer shall transmit sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow for driving the piles to the recommended pile tip elevations.

The hammer efficiency is defined as the percentage of the potential energy available as kinetic energy at impact. The system efficiency is defined as the ratio of the measured energy transmitted to the pile to the rated hammer energy.

PILE DRIVING REFUSAL

Pile driving refusal shall be defined as the point where pile driving resistance, using the hammer operating at manufacturer's rated energy and at or above the minimum system efficiency, meets one of the following conditions. The final refusal criteria will be developed for the particular hammer system selected by the Contractor and approved by the Engineer to drive the production piles.

A. 125 blows per 250 mm of penetration; or
B. 70 blows per 120 mm of penetration.

The final refusal criteria for the particular hammer system selected by the Contractor shall be approved by the Engineer to drive the production piles.

MINIMUM BLOW COUNT CRITERION

The minimum blow count will be determined by the Engineer based on the hammer selected by the Contractor and based on the wave equation method or ENR method.

PILE PENETRATION ACCEPTANCE AT ABUTMENT E23R

The requirements in Section 49-1.08 "Pile Driving Acceptance Criteria," of the Standard Specifications shall not apply.

Precast prestressed concrete pile acceptance at abutment E23R shall be based on the following criteria:

A. Piles driven to the specified tip elevation that meet the minimum blow counts during the initial driving will be accepted.
B. Piles driven to the specified tip elevation that do not meet the minimum blow count during initial driving will be considered as acceptable once it is demonstrated that at least 10 percent of the piles within the same abutment footing (excluding the bike path support) meet the minimum blow count either at the end of initial driving or during subsequent restrike.
C. Piles that encounter driving refusal from continuous driving within 3 meters of the specified pile tip elevation will be accepted.
D. For piles that encounter driving refusal more than 3 meters above the specified pile tip elevation, pile acceptance shall be evaluated by the Engineer before remedial installation procedures are undertaken.
E. Splices in precast prestressed concrete piles will not be permitted.

PILE RESTRIKES AT ABUTMENT E23R

The Contractor shall conduct restrikes on precast prestressed concrete piles at abutment E23R that previously have not met the minimum blow count criteria until it is demonstrated that at least 10 percent of the piles within the same abutment footing (excluding bikepath support) meet the minimum blow count either at the end of initial driving or during subsequent restrikes.

The initial restrikes shall be conducted a minimum of 48 hours after the end of initial driving. Subsequent restrikes on a given pile shall be conducted with a minimum of 48 hours between restrikes and within 28 days after the end of initial drive.

During pile restrikes, the pile shall be driven a minimum of 75 mm, and the restrike blow count shall be taken as the average blow count over the first 50 mm of the 75 mm penetration. The Contractor's approved diesel hammer shall be operated at the maximum fuel setting and hydraulic hammers shall be operated at the maximum stroke. Diesel hammers shall be warmed up prior to restriking the pile by having driven another pile with at least 100 blows.

Restrikes shall be conducted with a used 180-mm to 250-mm thick plywood pile cushion to ensure that sufficient energy is transferred to the pile during the restrike. A used pile cushion is defined as having received at least 50 blows from an acceptable pile driving hammer at maximum rated energy setting.

If the minimum blow count is not achieved for at least 10 percent of the piles after restriking has occurred at all piles, the Contractor shall immediately notify the Engineer. The Engineer may request subsequent restrikes.

DRIVING SYSTEM SUBMITTAL

Prior to installing driven piling, the Contractor shall provide a driving system submittal, including driveability analysis, in conformance with the provisions in "Working Drawings," of these special provisions. A submittal shall be made for each control location shown below. All proposed driving systems (i.e., each hammer that may be brought onto the site) shall be included in the submittal.

Bridge Number	Control Location
34-0006R	Abut E23R
34-0006L	Special sign foundation

The driving system submittal for steel pipe piles shall contain an analysis showing that the proposed driving systems will install piling to the specified tip elevation and specified bearing. Driving systems shall generate sufficient energy to drive the piles with stresses not more than 95 percent of the specified yield strength of the steel pile or unfilled steel shell. Submittals shall include the following:

A. Complete description of soil parameters used, including soil quake and damping coefficients, skin friction distribution, ratio of shaft resistance to nominal compression resistance, assumptions made regarding the formation of soil plugs, and assumptions made regarding drilling through the center of open ended steel shells.
B. List of all hammer operation parameters assumed in the analysis, including fuel settings, stroke limitations, and hammer efficiency.
C. Driveability studies that are based on a wave equation analysis using a computer program that has been approved by the Engineer. Driveability studies shall model the Contractor's proposed driving systems, including the hammers, capblocks, and pile cushions, as well as determine driving resistance and pile stresses for assumed site conditions. Separate analyses shall be completed at elevations above the specified tip elevations where difficult driving is anticipated. Studies shall include plots for a range of pile compression capacities above and below the nominal compression resistance shown on the plans. Plots shall include the following:

    1. Pile compressive stress versus blows per 0.30-m.
    2. Pile tensile stress versus blows per 0.30-m.
    3. Nominal compression resistance versus blows per 0.30-m.

    When the driveability analysis hammers indicate that open ended pipe pile and steel shell penetration rates are less than 0.30-m per 200 blows and the driving stresses will exceed 80 percent of the specified yield strength of the pipe and steel shell, the study shall include assumptions for drilling through the center of open ended pipe piles and steel shells.
D. Copies of all test results from any previous pile load tests, dynamic monitoring, and all driving records used in the analyses.
E. Completed "Pile and Driving Data Form," which is shown in these special provisions.

The driving system submittal shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. Prior to installing piling, the Contractor shall allow the Engineer 15 working days to review a driving system submittal after a complete set, as determined by the Engineer, has been received. Should the Engineer fail to complete his review within the time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in the driving system submittal review, 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.

For the precast prestressed concrete piles, the driving system submittal shall contain an analysis showing that the proposed driving systems will install piling to the specified tip elevation and specified bearing. Driving systems shall generate sufficient energy to drive the piles with stresses not more than the AASHTO allowable stresses. Submittals for the precast prestressed concrete piles shall include the following:

A. Complete description of soil parameters used, including soil quake and damping coefficients, skin friction distribution, and ratio of shaft resistance to nominal compression resistance.
B. List of all hammer operation parameters assumed in the analysis, including fuel settings, stroke limitations, and hammer efficiency.
C. Driveability studies that are based on a wave equation analysis using a computer program that has been approved by the Engineer. Driveability studies shall model the Contractor's proposed driving systems, including the hammers, capblocks, and pile cushions, as well as determine driving resistance and pile stresses for assumed site conditions. Separate analyses shall be completed at elevations above the specified tip elevations where difficult driving is anticipated. Studies shall include plots for a range of pile compression capacities above and below the nominal compression resistance shown on the plans. Plots shall include the following:

    1. Pile compressive stress versus blows per 0.25-m.
    2. Pile tensile stress versus blows per 0.25-m.
    3. Nominal compression resistance versus blows per 0.25-m.

The driving system submittal shall be signed and stamped by a professional engineer registered as a Civil Engineer in the State of California and shall include the attached "Pile and Driving Data Form" completed for each hammer and driving system. The Contractor shall allow the Engineer 20 working days to review a driving system submittal after a complete set, as determined by the Engineer, has been received. Should the Engineer fail to complete his review within the time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in the driving system submittal review, 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.

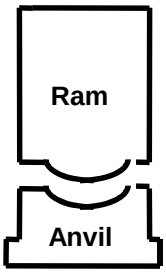
The Contractor shall use the driving system and installation methods described in the approved driving system submittal for a given control location. Any change in hammers from those submitted and approved by the Engineer shall also meet the requirements for driving system submittals. Revised and new driving system submittals shall be approved by the Engineer prior to using corresponding driving systems on production piling. The Contractor shall allow the Engineer 20 working days to review each revised and each new driving system submittal after a complete set, as determined by the Engineer, has been received.

Approval of pile driving equipment will not relieve the Contractor of his responsibility to drive piling, free of damage, to the specified penetration.

CALIFORNIA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION LABORATORY

PILE AND DRIVING DATA FORM

Structure Name :_____ Contract No.:_____
_____ Project:_____
Structure No.:_____ Pile Driving Contractor or
Dist./Co./Rte./kilo.post:_____ Subcontractor_____(Pile Driven By)



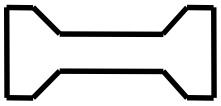
Hammer

Manufacturer:_____ Model:_____
Type:_____Serial No.:_____
Rated Energy:_____ at _____ Length of Stroke

Modifications: _____
_____
_____
_____
_____

Capblock (Hammer Cushion)

Material:_____
Thickness:_____mm Area:_____mm^2
Modulus of Elasticity - E:_____MPa
Coefficient of Restitution - e:_____



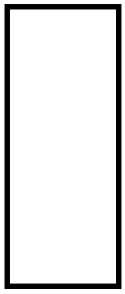
Pile Cap

Helmet
Bonnet
Anvil Block
Drivehead

Mass: k

Pile

Material:_____
Thickness:_____mm Area: _____mm^2
Modulus of Elasticity - E:_____MPa
Coefficient of Restitution - e:_____



Pile

Pile Type:_____
Length (In Leads):_____m
kg/m.:_____Taper:_____
Wall Thickness:_____mm
Cross Sectional Area:_____ mm^2
Design Pile Capacity:_____kN
Description of Splice:_____
_____
Tip Treatment Description:_____

DISTRIBUTE one copy

- ☐ Translab, Foundation Testing
- ☐ Translab, Geotechnical Design
- ☐ Resident Engineer

Note: If mandrel is used to drive the pile, attach separate manufacturer's detail sheet(s) including mass (kg) and dimensions.

Submitted By:_____ Date:_____

Jetting and Drilling

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles, except as provided herein.

Drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications may be used for cast-in-steel shell concrete piles. Drilling shall not extend below the top of the soil plug. Materials resulting from drilling holes shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications.

Dynamic Monitoring

Unless otherwise directed by the Engineer, three precast prestressed concrete piles at abutment E23R will be monitored during driving (or redriving) for dynamic response to the driving equipment. Monitoring will be done by State forces using State-furnished dynamic pile analyzer monitoring instruments. These provisions do not apply to the dynamic monitoring of falsework piles by the Contractor.

For the precast prestressed concrete piles, the Contractor shall drill and tap holes at opposite sides of the pile at about two pile diameters from the top and set anchors for the PDA instrument.

The Contractor shall provide electric power (120-volt, 60 cycles stable power) for the State's monitoring equipment, access to the piles including a working platform, and shelter for State monitoring personnel and equipment.

The Engineer will determine which precast prestressed concrete piles will receive dynamic monitoring. Piles to be dynamically monitored shall be made available to State forces 2 business days prior to driving. The piles shall be safely supported a minimum of 150 mm off the ground in a horizontal position on at least 2 support blocks. The pile shall be positioned so that State forces have safe access to the entire pile length and circumference for the installation of anchorages and control marks for monitoring. The Contractor shall rotate the piles on the blocks as directed by the Engineer.

Piles to be dynamically monitored shall be prepared and driven as follows:

A. The Engineer will determine if the Contractor's handling operations during lifting of the pile to be monitored are such that pile monitoring instrumentation can be attached to the pile prior to lifting without damage to the instruments. If the Engineer determines that instruments cannot be mounted prior to lifting of the pile, operations shall be suspended for approximately 30 minutes before hammer placement. During this time, the Contractor shall attach the monitoring instruments onto the pile.
B. Prior to resuming driving operations, the Contractor shall connect electrical cables to the instrument package as approved by the Engineer.
C. Driving operations shall resume as directed by the Engineer. The Contractor's driving equipment shall provide sufficient clearances for monitoring instruments such that piles can be driven to the specified pile tip elevation without damage to the monitoring instruments.

Within 1 hour of completion of driving operations, the Contractor shall remove the cables and instrument package from the pile and deliver them to the Engineer.

The Contractor shall be responsible for damage to the State's cables and instruments caused by the Contractor's operations and shall replace damaged cables or instruments in kind.

CAST-IN-DRILLED-HOLE CONCRETE PILES

GENERAL

Summary

Cast-in-drilled-hole (CIDH) concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

SUBMITTALS

Pile Installation Plan

The Contractor shall submit a pile installation plan to the Engineer for approval for all CIDH concrete piling. The pile installation plan shall be submitted at least 15 days before constructing CIDH concrete piling and shall include complete descriptions, details, and supporting calculations for the following:

A. Concrete mix design, certified test data, and trial batch reports.
B. Drilling or coring methods and equipment.
C. Proposed method for casing installation and removal when necessary.
D. Plan view drawing of pile showing reinforcement. Include inspection pipes on the drawing, if inspection pipes are required.
E. Methods for placing, positioning, and supporting bar reinforcement.
F. Methods and equipment for determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
G. Methods and equipment for verifying that the bottom of the drilled hole is clean before placing concrete.
H. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

For concrete placed under slurry, the pile installation plan shall also include complete descriptions, details, and supporting calculations for the following:

A. Concrete batching, delivery, and placing systems, including time schedules and capacities. Time schedules shall include the time required for each concrete placing operation at each pile.
B. 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.
C. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
D. Slurry testing equipment and procedures.
E. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
F. Methods and equipment for slurry agitating, recirculating, and cleaning.

QUALITY ASSURANCE

Concrete Test Batch

Before concrete is deposited under slurry, a concrete test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during placement of concrete in the piles. Concrete shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of concrete under slurry will not be required. In addition to meeting the specified nominal slump, the concrete 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 concrete test batch shall demonstrate that the proposed concrete mix design achieves a slump of at least 175 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 concrete test batch shall demonstrate that the proposed concrete mix design achieves a slump of at least 175 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. Concrete shall not be vibrated or agitated during the test period. Slump tests will be performed in conformance with the requirements in California Test 556.

Upon completion of testing, 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.

MATERIALS

Concrete

Concrete deposited under slurry shall have a nominal slump equal to or greater than 175 mm, contain not less than 400 kilograms of cementitious material per cubic meter, and be proportioned to prevent excessive bleed water and segregation. The nominal and maximum slump and penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply.

Concrete shall conform to the requirements in "Corrosion Control for Portland Cement Concrete" of these special provisions.

Aggregate Grading

The combined aggregate grading 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.

When concrete is placed under slurry, the combined aggregate grading shall be either 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.

Slurry

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
*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.		

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

General

CIDH concrete piling 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Portions of CIDH concrete piling shown on the plans to be formed shall be formed and finished in conformance with the provisions for concrete structures in Section 51, "Concrete Structures," of the Standard Specifications.

Placing Concrete

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. 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 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 meters 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 meters 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 meters 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 3 meters above the piezometric head or within 300 mm of the top of the drilled hole, whichever is higher.

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 meters 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 before 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 a temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 meters above the bottom of the casing. The withdrawal of the casing shall not cause contamination of the concrete with slurry. If slurry is not used, the temporary casing shall not be withdrawn until the concrete head in the casing is greater than the groundwater outside of the casing. This positive concrete head shall be maintained during the withdrawal of the casing.

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.

Disposal of material resulting from using slurry, for cast-in-drilled-hole-concrete piles in the contaminated material areas shown on the plans, shall conform to the provisions in "Handling, Transportation, and Disposal of Contaminated Material," of these special provisions.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all CIDH concrete piling 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing in a manner that controls ground water.

The furnishing and placing of inspection pipes shall conform to the following:

A. Inspection pipes shall be Schedule 40 PVC pipe with a nominal inside diameter of 50 mm. Watertight PVC couplers are permitted to facilitate pipe lengths in excess of those which are commercially available. 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.
B. Each inspection pipe shall be capped at the bottom and shall extend from 0.9 meter above the pile cutoff down to the bottom of the reinforcing cage. A temporary top cap or similar means shall be provided to keep the pipes clean before testing. If pile cutoff is below the ground surface or working platform, inspection pipes shall be extended to 0.9 meter above the ground surface or working platform. Approved covers or railings shall be provided and inspection pipes shall be located as necessary to minimize exposure of testing personnel to potential falling hazards.
C. Inspection pipes shall be completely clean, dry, and unobstructed at the time of testing providing a 50 mm diameter clear opening.
D. The inspection 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 CIDH concrete piling shall be constructed so that the relative distance of inspection pipes to vertical steel reinforcement shall remain constant.
E. When any changes are made to the tip of CIDH concrete piling, the Contractor shall also extend the inspection pipes to the bottom of the reinforcing cage.

The following additional requirements apply if inspection pipes are not shown on the plans:

A. Inspection pipes shall be placed radially around the pile, inside the outermost spiral or hoop reinforcement and no more than 25 mm clear of the outermost spiral or hoop reinforcement.
B. Inspection pipes shall be placed around the pile 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. Inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the spacing required herein.
C. Inspection pipes shall be placed a minimum of 75 mm clear of the vertical reinforcement. When the vertical reinforcement configuration does not permit this clearance while achieving radial location requirements, distance to vertical rebar shall be maximized while still maintaining the requirement for radial location.
D. Where the dimensions of the pile reinforcement do not permit inspection pipes to be placed per these requirements, a plan for tube placement shall be submitted to the Engineer for approval in the Pile Placement Plan with a request for deviation before fabricating pile reinforcement.

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 32 mm diameter rigid cylinder 1.375 meters long through the length of pipe. If an inspection pipe fails to pass the 32-mm-diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

For each inspection pipe that does not pass the 32-mm diameter cylinder, the Contractor shall core a nominal 50-mm diameter hole 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 125 mm clear from 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. 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 be in conformance with the Department's "Soil and Rock Logging, Classification, and Presentation Manual." Coring logs shall include Core Recovery (REC), Rock Quality Designation (RQD), locations of breaks, and 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 delivered to the Engineer upon completion. The Engineer will evaluate the portion of the pile represented by the cored hole based on the submitted core logs.

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 conducted in conformance with California Test 233. The Contractor shall not conduct operations within 8 meters 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 piles, the Contractor shall allow 20 days for the Engineer to conduct these tests and make determination of acceptance. 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.

The Engineer may elect to perform additional tests to further evaluate a pile. These tests may include crosshole sonic logging and other means of inspection selected by the Engineer. When the Engineer elects to perform additional tests to further evaluate anomalies for a rejected pile, no time requirement exists for performing these tests. The Contractor may progress with the mitigation plan process without waiting for these supplemental results.

Inspection pipes and cored holes shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. 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 and California Test 233, Part 5C, 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 Engineer will determine whether the rejected pile requires mitigation due to structural, geotechnical, or corrosion concerns. The Engineer will consider the estimated size and location of the anomaly and potential effects upon the design. The Engineer will provide the conclusions of this analysis to the Contractor for development of a mitigation plan, if required. The Contractor shall allow 35 days for the Engineer to determine whether the pile requires mitigation and provide information to the Contractor. Day 1 of the 35 days shall be the first day after access has been provided to the Engineer to perform acceptance testing. If additional information is submitted to the Engineer that modifies the size, shape, or nature of the anomaly, the Contractor shall allow 15 additional days for the subsequent analysis.

If the Engineer determines that a rejected pile does not require mitigation, 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 meter, 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.

If the Engineer determines that a rejected pile requires mitigation, the Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected CIDH concrete pile conforming to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. 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.

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-Kilopost, 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. This requirement is waived for approved mitigation plans when either of the following conditions are present:

    1. The proposed mitigation will be performed in conformance with the most recent Department approved version of "ADSC Standard Mitigation Plan 'A' - Basic Repair" without exception or modification.
    2. The Engineer has determined that the rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, and the Contractor elects to repair the pile using most recent Department approved version of "ADSC Standard Mitigation Plan 'B' - Grouting Repair" without exception or modification.

The most recent Department approved version of the "ADSC Standard Mitigation Plan" is available at:

http://www.dot.ca.gov/hq/esc/geotech/ft/adscmitplan.htm

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 piles.
B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piles.

All provisions for CIDH concrete piling shall apply to replacement piles.

The Contractor shall allow the Engineer 20 days 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-Kilopost, 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.

Structure Backfill

The structure backfill placed at the locations of the cast-in-drilled-hole concrete piling for the high mast lighting assemblies shall conform to the requirements in Section 19-3.06, "Structure Backfill," of the Standard Specifications. Placement of the structure backfill shall conform to the requirements in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

OPEN ENDED CAST-IN-STEEL-SHELL CONCRETE PILING

Cast-in-steel-shell concrete piling shall consist of driven open ended steel shells filled with reinforced cast-in-place concrete and shall conform to the provisions in Section 49-4, "Cast-in-Place Concrete Piles," of the Standard Specifications and these special provisions.

The piles shall be installed open ended and no internal plates shall be used.

The Contractor shall submit to the Engineer for approval, a cleanout method for open ended cast-in-steel-shell concrete piling. Care shall be taken during cleaning out of open ended steel shells to prevent disturbing the foundation material surrounding the pile. Piles shall be cleaned out to the limits shown on the plans. Equipment or methods used for cleaning out steel shells shall not cause quick soil conditions or cause scouring or caving around or below the piles. Open ended steel shells shall be free of any soil, rock, or other material deleterious to the bond between concrete and steel prior to placing reinforcement and concrete.

After the steel shells have been cleaned out, the pile shall be constructed expeditiously in order to prevent deterioration of the surrounding foundation material from the presence of water. Deteriorated foundation materials, including materials that have softened, swollen, or degraded, shall be removed from the bottom of the steel shells and shall be disposed of.

Material resulting from cleaning out the steel shells 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, unless otherwise specified or permitted by the Engineer.

Reinforcement shall be placed and secured symmetrically about the axis of the pile and shall be securely blocked to clear the sides of the steel shell.

If conditions render it impossible or inadvisable in the opinion of the Engineer to dewater the open ended cast-in-steel-shell concrete piling prior to placing reinforcement and concrete, the bottom of the shell shall be sealed in conformance with the provisions in Section 51-1.10, "Concrete Deposited Under Water," of the Standard Specifications. The sealed shell shall then be dewatered and cleaned out as specified herein.

STEEL PIPE PILING

GENERAL

Summary

Steel pipe piling shall consist of unfilled steel pipe piling, steel shells for open and closed ended cast-in-steel-shell concrete piling, and permanent steel casing for cast-in-drilled-hole concrete piling. Steel pipe piling shall conform to the provisions in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

All steel pipe piling for this project shall be designated as Class R steel pipe piling.

Submittals

Steel pipe piling qualification audits shall be submitted in conformance with the provisions in "Steel Pipe Piling Qualification Audit" of these special provisions.

A Certificate of Compliance demonstrating material traceability shall be furnished in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be signed by the facility's authorized Quality Control Representative. The Quality Control Representative shall be on record with the Department's Office of Structural Materials. The Certificate of Compliance shall include:

1. A statement that all 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 and these special provisions.
2. An attached certified mill test report (MTR) for each heat number of steel pipe piles being furnished.
3. The carbon equivalency (CE) calculated as $CE=C + (Mn+Si)/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15$. The CE shall be 0.45% maximum and may be shown on the MTR.

The Contractor shall submit a TL-38 Inspection Request form at least 48 hours before performing any field welding of steel pipe piling.

The TL-38 Inspection Request form is available at:

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

Working drawings shall be submitted to the Engineer before attaching handling devices to steel pipe piling. Working drawings shall include locations, handling and fitting device details, and connection details. Attachments shall not be made to steel pipe piling until the working drawings are approved in writing by the Engineer. The Contractor shall allow the Engineer 7 days for review.

MATERIALS

General

The provisions of "Welding Quality Control" of these special provisions shall not apply to longitudinal, skelp end, or spiral seam welds in steel pipe piling.

Circumferential welds shall conform to "Welding Quality Control" of these special provisions and the following:

1. Circumferential welds shall be complete joint penetration welds conforming to AWS D1.1.
2. Welds shall be located at least 300 mm away from a skelp end weld.
3. Backing rings shall conform to the following:

    3.1. The minimum thickness shall be 6 mm and the backing ring shall be continuous.
    3.2. Splices in the backing ring shall be made by complete joint penetration welds. These welds shall be completed and inspected, including any required nondestructive testing, before final insertion into a pipe end.
    3.3. The attachment of backing rings to pipe ends shall be done using the minimum size and spacing of tack welds that will securely hold the backing ring in place. Tack welding shall be done in the root area of the weld splice. Cracked tack welds shall be removed and replaced before subsequent weld passes.
    3.4. The gap between the backing ring and the steel pipe piling wall shall not be greater than 2 mm. One localized portion of the backing ring fit-up, that is equal to or less than a length that is 20 percent of the outside circumference of the pipe, as determined by the Engineer, may be offset by a gap equal to or less than 6 mm, provided that this localized portion is first seal welded using shielded metal arc E7016 or E7018 electrodes. This localized portion shall be marked so that it can be referenced during any required NDT.
    3.5. Backing rings shall have sufficient width so that the backing ring will not interfere with the interpretation of the NDT.

4. For steel pipe with an outside diameter greater than 1.1 m and with a wall thickness greater than 25.4 mm, the root opening tolerances may be increased to a maximum of 5 mm.
5. For welding limited to fit-up and attaching backing rings and handling devices, the preheat and interpass temperature shall be in conformance with the requirements in AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with Table 3.2, Category C.

All steel pipe piling shall be capable of meeting the fit-up requirements of AWS D1.1, Section 5.22.3.1, "Girth Weld Alignment (Tubular)," when the material is spliced utilizing a girth weld.

For the purposes of welding and prequalification of base metal, steel pipe piling designated as ASTM A 252 shall be treated as ASTM A 572/A 572M, Grade 50, or ASTM A 709/A 709M, Grade 50, in conformance with the requirements in AWS D1.1, Table 3.1.

Butt welded seams subsequently formed, including skelp end welds, shall be 100 percent ultrasonically tested in the final formed and welded condition. The acceptance criteria for UT shall conform to API 5L for API-licensed facilities or AWS D1.1 for cyclically loaded nontubular connections for welds subject to tensile stress.

Except for tack welding, gas metal arc welding (GMAW) shall not be used for the welding of steel pipe piling. When GMAW is used for tack welding, the filler metal shall not be deposited by short circuiting transfer.

The dimensional tolerances of steel pipe piling shall conform to the following:

1. Outside diameter: ± 0.75% of the specified outside diameter
2. Wall thickness: -5%, +10% of the specified nominal wall thickness
3. Straightness: ± 1.0% over the length of the pipe

Except for steel pipe piling marked with the API monogram, each length of steel pipe piling shall be marked as follows:

1. Name and location of the piling manufacturer
2. State Contract number
3. Heat number
4. Welding process
5. Outer diameter, nominal wall thickness, minimum wall thickness, and length
6. Year piling was produced
7. Marked as specified below for each class of steel pipe piling. Only Caltrans audited facilities are approved to mark piling for use on this project.

Class R Steel Pipe Piling

Class R steel pipe piling shall conform to one of the following:

1. Manufactured, welded, tested, and inspected in conformance with API 5L, minimum Grade X52, PSL1, and the following:

   1.1. Steel pipe piling shall be manufactured by a facility licensed to apply the API monogram.
   1.2. Hydrostatic testing, flattening tests, and the API monogram will not be required.
   1.3. Each length shall be marked "Caltrans Class R - API."

2. Manufactured in conformance with ASTM A 252, Grade 3, and the following:

   2.1. Arc welding processes shall conform to AWS D1.1.
   2.2. Groove welds using submerged arc welding from both sides without backgouging will require a procedure qualification record witnessed by the Engineer.
   2.3. Underfill will not be allowed.
   2.4. For electric resistance welded pipe, the outer diameter flash shall be removed to a maximum of 0.76 mm.
   2.5. The weld reinforcement shall not exceed 3 mm.
   2.6. The weighing of individual pipe will not be required as specified in ASTM A 252.
   2.7. Each length shall be marked "Caltrans Class R - A 252."

CONSTRUCTION

General

Steel pipe piling may be re-tapped to prevent pile set-up provided the field welded splice remains at least 1 meter above the work platform until that splice is approved in writing by the Engineer.

Welds used to attach handling devices to steel pipe piling shall be aligned parallel to the axis of the pile and shall conform to the requirements for field welding specified herein. Permanent bolted connections shall be corrosion resistant.

Field Welding

Field welding of steel pipe piling is defined as welding performed after the material has been transported from an audited facility.

Field welding shall conform to the requirements for circumferential welds as specified in "Materials" of this section and the following:

1. Welds made in the horizontal position where the longitudinal pipe axis is vertical shall be single-bevel groove welds.
2. The minimum preheat and interpass temperature for splice welding and for making repairs shall be 66°C, regardless of the pipe pile wall thickness or steel grade. In the event welding is disrupted, preheating to 66°C shall occur before welding is resumed.
3. Welds shall not be water quenched. Welds shall be allowed to cool unassisted to ambient temperature.

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 cleaning out the open ended steel shells prior to installing reinforcement and filling with concrete, for disposing of materials removed from the inside of the pile, dewatering the open ended steel shells, as shown on the plans, as specified in these special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile, and no additional compensation will be allowed therefor.

Full compensation for conforming to the provisions in "Steel Pipe Piling" of these special provisions 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.

Full compensation for redriving monitored piles, for dewatering during monitoring, and for installing and removing the instruments from the pile shall be considered as included in the contract unit price paid for drive pile, and no separate payment will be made therefor. The length of piling to be paid for as furnish piling of the classes listed in the Engineer's Estimate shall include the lengths that monitored piles are redriven.

Full compensation for driving system submittals shall be considered as included in the contract unit price paid for drive pile, and no additional compensation will be allowed therefor.

Full compensation for restriking of piles shall be considered as included in the contract unit price paid for drive pile of the types shown in the Engineer's Estimate and no additional compensation will be made therefor.

Full compensation for supply of electrical power for dynamic monitoring shall be considered as included in the contract unit price paid for drive pile of the types shown in the Engineer's Estimate and no additional compensation will be made therefor.

Full compensation for providing access and for installing and removing the monitoring instruments from the pipe shall be considered as included in the contract unit price paid for drive pile of the types shown in the Engineer's Estimate and no separate payment will be made therefor.

Full compensation for probing at pile locations to determine the extent of existing rock dike, as described in this section, shall be considered as included in the contract unit price paid for drive pile of the types shown in the Engineer's Estimate and no additional compensation will be made therefor.

Full compensation for furnishing and installing 150mm foam material around the special sign foundation piles at bikepath abutment shall be considered as included in the contract unit price paid for drive pile of the types shown in the Engineer's Estimate and no additional compensation will be made therefor.

10-1.62 MICROPILING

Micropiling, consisting of small diameter threaded joint steel casing with a central reinforcing bar that is grouted in place, shall conform to the design requirements and layout shown on the plans and these special provisions.

Attention is directed to "Supplemental Project Information," "Vibration Monitoring," and "Welding" of these special provisions.

Attention is directed to "Order of Work", "Permits, Licenses, Agreements, and Certifications," of these special provisions regarding permit restrictions and regulations that may impact pile installation.

MATERIALS

Steel pipe casing may be substituted as specified in "Substitution of Non-Metric Materials and Products" of these special provisions.

No welding of joints will be allowed in the steel pipe casing.

Steel casing for micropiles have threaded joints and shall be at least the diameter and wall thickness of the piles shown on the plans. The outside diameter of the steel casing shall not exceed 245 mm.

Steel casing shall conform to the following:

1. Manufactured, welded, tested, and inspected in conformance with the requirements in API 5CT, minimum Grade N80, and the following:

   1.1. Manufactured by a facility licensed to apply the API monogram.

   1.2. Each length of steel pipe casing shall be marked with the API monogram in conformance with API 5CT.

2. Secondary N80 pipe casing shall not be used for micropiles.

The upper section of casing shall be 275 MPa yield strength weldable pipe conforming to ASTM A-106 or A-519. No casing joint shall be located within 1.5 meters of the bottom of the footing.

The micropile anchorage shall consist of steel rings and bearing plate with nut and washer. The bearing plate and steel rings shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications, except that galvanizing will not be required.

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 1.8-mm maximum clear opening prior to being introduced into the grout pump. Grout shall contain at least 500 kg of cement per cubic meter. Grout shall be non-shrink type. Grout in micropiles shall be installed under at least one MPa of pressure.

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions. Where splices are allowed as shown on the plans, micropile reinforcement splices shall be made by complete penetration welding in conformance with the requirements in AWS D1.4.

WORKING DRAWINGS

The Contractor shall submit complete project specific working drawings for the micropile system in conformance with the provisions in "Working Drawings" of these special provisions.

The pile vendor company name, address, and phone number shall be shown on the working drawings.

Working drawings for micropiles shall contain all information required for the construction and quality control of the piling, including the following:

A. Step-by-step procedure describing all aspects of pile installation including personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail so that the Engineer can monitor the construction and quality of these micropiles.
B. Details for drilling a plumb hole.
C. Details of centralizers.
D. Grout mix designs.
E. Details and procedures involved in testing components, including grout.
F. Pipe and reinforcement splice locations.
G. Details of equipment and operation for grouting. Details shall be included for monitoring grout quality, volume installed, and pressure during installation.
H. Information on the minimum cure time and strength requirements of the pile system for test piles.

A supplement to the working drawings shall include construction details, structural details, and load test results from at least 3 previous successful installations by the proposed micropile vendor. The installations shall be from 3 separate test sites. The installations shall be similar to those proposed for this contract.

The working drawings shall be stamped and signed by an engineer who is licensed as a Civil Engineer in the State of California.

No micropile shall be installed until the Engineer has approved, in writing, the working drawing submittal for micropiling.

CONSTRUCTION

Drill cuttings resulting from installing micropiling shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications. Material resulting from grouting micropiles 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, unless otherwise permitted in writing by the Engineer.

Steel casing shall be advanced using a vibration-free and impact-free pile installation method such as rotary drilling.

Difficult pile installation is anticipated at a depth of 14.3 meters and below during the construction due to the presence of very dense sand and stiff to very stiff clay layers. However, water jetting, provided that it does not disturb the soil surrounding the piles, is acceptable through the pile tip to penetrate these very dense/very stiff layers during drilling to the specified tip elevation. The piling installation method shall be suitable with high groundwater which is anticipated during pile installation.

Drilling mud or chemical stabilizers shall not be used.

Foreign material dislodged or drawn into the hole during construction of the micropiles shall be removed. Loose material existing at the bottom of the hole after drilling operations are complete shall be removed prior to placing grout.

Steel casing and threaded bars shall be installed using centralizers as shown on the plans.

The pipe shall be placed vertically and grouted in place. Grout shall be injected at the bottom of the pile and may be placed before or after placing the steel pipe.

A positive means of support shall be provided for maintaining the position of the casing and threaded bars until the grout has set.

TESTING

The Contractor shall conduct performance and proof load testing of the state-designed micropiles consisting of compression load testing in conformance with "Compression Load Testing" of these special provisions.

The Contractor shall furnish labor, materials, tools, equipment, and incidentals as required to conduct the performance and proof testing.

The ground surface shall be excavated as necessary to accommodate the load test frame allowing adequate space for placing, removing, and accessing the test frame during all testing operations.

The test area shall be dewatered, prepared, and made level before pile load testing. The excavation shall be kept dewatered during load testing.

After completion of testing the ground surface shall be backfilled to finished grade.

Unless otherwise specified or shown on the plans, steel plates welded to the load test and anchor piling shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 36 [250], and shall be welded to the piling in conformance with the requirements in AWS D1.1.

Performance Testing

The Contractor shall conduct performance micropile load tests to evaluate the micropile design. Performance micropile load tests shall conform with the following requirements:

A. The Contractor shall install one non-production test pile group at a location determined by the Engineer. The test pile group shall consist of a test pile and two anchor piles of the same length as the test pile.
B. The Contractor shall notify the Engineer, in writing, not less than 5 working days in advance of drilling or driving the non-production test pile group.
C. The Engineer may revise specified tip elevations based on performance test results.
D. Performance test results shall be approved by the Engineer prior to installing production piling.
E. The acceptance criteria for performance load testing of micropiles is as follows:

    1. The pile shall sustain the first compression test load applied which is equal to the nominal resistance for test shown on the plans, with no more than 13 mm total axial movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.

Proof Testing

The Contractor shall conduct proof micropile load tests to ensure that the Contractor installs production micropiling with at least the same quality and methods that were used to install the performance test micropiles. Proof micropile load tests shall conform with the following requirements:

A. The Contractor shall conduct proof tests after all the micropiles have been installed in a given footing. The Engineer will select one pile per footing to be proof tested.
B. The test will consist of compression load testing to the Nominal Resistance for Test indicated on the plans.
C. The acceptance criterion for proof load testing of micropiles is as follows:

    1. The pile shall achieve and sustain for 5 minutes the first compression test load applied which is equal to the nominal compression resistance, 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.

D. If a production micropile that is proof tested fails to meet the above acceptance criterion for testing, then that pile will be rejected, and all the other micropiles in that same footing will be tested. Rejected micropiling shall be replaced at a location approved by the Engineer. The Contractor shall submit to the Engineer for approval a plan for replacing piling or for installing additional micropiling that includes details for micropiling and footing modifications as required to provide the total micropiling support as shown on the plans. No extension of time or compensation will be made for the review of a plan for replacing or installing additional micropiling.

ALTERNATIVE PILING

At the Contractor's option, the Contractor may propose to substitute alternative piling for the State designed micropiling as shown on the plans and as specified in these special provisions.

Use of alternative piling is contingent on approval of working drawing submittal and successful performance of the alternative piling under load testing. Development and approval of working drawings and testing will be at the Contractor's expense. There will be no compensation and no extension of contract time allowed for the approval process to permit use of any proposed alternative pile.

It is anticipated that only those vendors with approved generalized working drawings will be able to perform within the working days given for this contract.

Some of the alternative piles listed may not be suitable for this contract, and some may be proprietary or have proprietary components.

Materials

Alternative piling shall conform to the provisions of Sections 19, "Earthwork," 49, "Piling," 50, "Prestressing Concrete," 51, "Concrete Structures," 52, "Reinforcement," and 75, "Miscellaneous Metal," of the Standard Specifications, these special provisions, and the pile layout shown on the plans.

Alternative piling shall incorporate steel pipe piling with at least the nominal diameter, wall thickness, and length as shown on the plans and shall conform to the material properties for the steel pipe piling specified in these special provisions.

Alternative piling shall incorporate a pile system with a diameter, including grout encasement, that is no more than the maximum dimensions shown on the plans.

Alternative piling shall incorporate at least a 6 mm thickness of sacrificial steel for corrosion protection.

Approved Generalized Working Drawings

The vendors listed below have on file generalized working drawings for the given alternative piling that has been successfully system tested and approved by the Engineer.

Required project specific working drawings as specified below in "Working Drawings" shall reference the approved generalized working drawings, and duplicate information shall not be included.

ALTERNATIVE PILE	ADDRESS AND PHONE NUMBER
DBM Micropile System	DBM Contractors Inc. P.O. Box 6139 Federal Way, WA 98063-6139 (800) 562-8460
Malcolm Micropile	Malcolm Drilling Co., Inc. 4926 North Azusa Canyon Rd. Irwindale, CA 91706 (626) 338-0035
Nicholson Pin Pile	Nicholson Construction Company 12 McClane St Cuddy, PA 15031 (800) 388-2340
Tubex Grout Injection Pile	Foundation Construction Inc PO Box 97 Oakley CA 94561 (925) 754-6633

Working Drawings

If the Contractor elects to use alternative piling, including any of those listed above, the Contractor shall submit complete project specific working drawings for the alternative pile system to the Engineer in conformance with the provisions in "Working Drawings" of these special provisions.

The pile vendor company name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Working drawings for alternative piling shall contain all information required for the construction and quality control of the piling, including the following:

A. Information on space requirements for installation equipment.
B. Step-by-step procedure describing all aspects of pile installation including materials, personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail so that the Engineer can monitor the construction and quality of these alternative piles. Installation procedure and materials specified for use in the pile system shall conform to the provisions in the Standard Specifications and these special provisions. When the Standard Specifications are not fully applicable, the section(s) shall be cited and the exceptions noted on the working drawings. If no applicable Standard Specification is available, ASTM or other industry standard specifications shall be referenced.
C. Details of the anchorage of the pile to the pile cap.
D. Details of pile splices.
E. Details of bar reinforcement, centralizers, and bar reinforcement splices.
F. Grout mix designs.
G. Details of the pile load test frame, connections, and anchor piling.
H. Details of the testing procedures involved in testing the piles.
I. Details and procedures involved in testing components, including grout.
J. Information on the minimum cure time and strength requirements of the pile system for performance test piles and proof test piles.
K. Minimum pile tip elevations.

A supplement to the working drawings shall include the following:

A. Independently checked calculations for pile design including:

1. Analysis of pile structural capacity based on the nominal strength as defined in Caltrans Bridge Design Specifications (Article 8.1.3) or the nominal resistance as defined in the LRFD Bridge Design Specifications (Article 1.3.2.1).
2. Complete structural details and calculations related to the pile system such as member element size, material specifications, connections to the pile cap, and connections for load testing that satisfy the nominal strength requirement.
3. Geotechnical assessment of information provided by the State for this site. At the Contractor's option, the Contractor may conduct additional geotechnical investigation for the purpose of designing alternative piles.
4. Analysis of the ductility of the alternative pile system for lateral footing deflections of up to 150 mm for compatibility with the State designed pile footing shown on the plans.
5. Analysis of geotechnical capacity of pile system based on the given loads and the minimum pile tip elevations shown on the working drawings.

B. Calculations for design capacity of the load frame.
C. Information on provisions for proximity to underground facilities and for isolating piles from settling embankments.
D. Construction details, structural details, and load test results from at least 3 previous successful installations by the proposed alternative pile vendor. The installations shall be from 3 separate test sites. The installations shall be similar to those proposed for this contract.

The working drawings and supplement shall be stamped and signed by an engineer who is licensed as a Civil Engineer in the State of California.For alternative piles listed above with approved generalized working drawings on file, the Contractor shall allow the Engineer 30 working days to review the working drawing submittal after a complete set has been received.

For alternative piles not listed, the Contractor shall allow the Engineer 180 working days to review the working drawing submittal after a complete set has been received.

No alternative pile shall be installed until the Engineer has determined that no aspect of the design will be compromised by the use of that alternative piling and has approved in writing the working drawing submittal for alternative piling.

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 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.

Construction

Drill cuttings resulting from installing alternative piling shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Materials," of the Standard Specifications. Material resulting from grouting or placing concrete in alternative piles, including slurry, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," unless otherwise permitted in writing by the Engineer.

System Testing

Alternative piles shall be system tested, by the Contractor. System testing includes demonstration and documentation of installation and load testing to geotechnical failure, both in tension and compression. System pile load testing shall be in conformance with "Performance Testing" as specified below except that the maximum load required to achieve geotechnical failure may exceed the maximum load specified for performance load testing. Geotechnical failure occurs when the total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of load testing, exceeds a value of at least 10 percent of the pile system diameter, or 50 mm, whichever is greater. Higher capacity load frames than those used for performance testing may be required. The same pile shall not be used for both tension and compression system load tests.

Approved Pile System Load Testing

The alternative pile vendors listed below have on file pile system load test results that have been approved by the Engineer, and additional system testing is not required. Generalized working drawings have not been approved for the vendors listed below.

ALTERNATIVE PILE	ADDRESS AND PHONE NUMBER
GeoJet Foundation System	Condon-Johnson 480 Roland Way Ste. 200 Oakland, CA 94621 (510) 636-2100

Performance and Proof Testing

The Contractor shall conduct performance and proof pile tests consisting of compression load testing. Submitted performance test results shall be approved by the Engineer prior to installing production piling at locations shown on the plans.

The Contractor shall install at least one non-production alternative test pile group, each group consisting of a test pile and anchor piles, that is constructed outside of a proposed or existing footing at a location approved by the Engineer. The Contractor shall notify the Engineer 5 working days prior to installing an alternative test pile group that is to be performance tested.

The Contractor shall proof test at least 1 alternative pile per footing after all the piles have been installed at a given footing. The piles to be tested will be selected by the Engineer.

The apparatus for applying test loads shall have a capacity of at least 120 percent of the compression and tension resistance of the test pile structural section, but need not exceed 150 percent of the maximum nominal resistance shown on the plans.

If an alternative pile that is performance tested fails to meet any of the acceptance criteria for testing as determined by the Engineer, that pile will be rejected and the Contractor shall modify the design or construction procedures and submit revised working drawings including these modifications. The Contractor shall install and performance test another alternative pile, or abandon the alternative pile option and install the State designed piling shown on the plans. Pile installation operations shall not continue until the Engineer has approved the revised working drawings in writing. No extension of time or compensation will be made for modifying working drawings nor for installing and testing additional alternative piling.

If an alternative pile that is proof tested fails to meet any of the acceptance criteria for testing as determined by the Engineer, that pile will be rejected, and all the remaining alternative piles in that same footing shall be proof tested. The Contractor shall submit to the Engineer for approval a plan for replacing piling or for installing additional alternative piling that includes details for piling and footing modifications as required to provide the total piling support as shown on the plans. No extension of time or compensation will be made for the review of the plan nor for replacing or installing additional alternative piling.

Compression Load Testing

Compression testing shall conform to ASTM Designation: D 1143 and these special provisions.

For performance compression load tests, the loads applied and the corresponding durations shall be as shown in the following table:

PERFORMANCE COMPRESSION LOAD TEST SCHEDULE	
LOAD	DURATION
0	1 minutes
0.1C	5 minutes
0.2C	5 minutes
0.3C	5 minutes
0.4C	5 minutes
0.5C	5 minutes
0.6C	5 minutes
0.7C	5 minutes
0.8C	5 minutes
0.9C	5 minutes
1.0C	5 minutes
0.75C	1 minute
0.5C	1 minute
0.25C	1 minute
0	1 minute
0.1C	1 minute
0.2C	1 minute
0.3C	1 minute
0.4C	1 minute
0.5C	1 minute
0.6C	1 minute
0.7C	1 minute
0.8C	1 minute
0.9C	1 minute
1.0C	1 minute
1.1C	5 minutes
1.2C*	5 minutes
C = Nominal compression resistance for test shown on the plans. * After a 5 minute interval, remove the full load from the pile in four approximately equal decrements with 5 minute intervals between each decrement.	

For proof compression load tests, the loads applied and the corresponding durations shall be as shown in the following table:

PROOF COMPRESSION LOAD TEST SCHEDULE	
LOAD	DURATION
0	1 minutes
0.25C	5 minutes
0.5C	5 minutes
0.75C	5 minutes
1.0C*	5 minutes
C = Nominal compression resistance for test shown on the plans. *After a 5 minute interval, remove the full load from the pile in four approximately equal decrements with 5 minute intervals between each decrement.	

The acceptance criterion for compression load testing of alternative piles is as follows:

A. The pile shall achieve and sustain for 5 minutes the first compression test load applied which is equal to the nominal compression resistance 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.

Test Submittals

At the completion of a performance or proof test, the Contractor shall submit to the Engineer four copies of the complete test results for the alternative pile tested. Data for each test shall list key personnel, test loading equipment, alternative pile location, pile tip elevation, and length of reinforcement. Test data shall also list quantity of grout and grout pressure used or amount of concrete placed; location grout or concrete is placed; amount of ground water encountered; and the time and dates of reinforcement installation, grouting or concrete placement, and pile testing. The alternative pile movements at each load and corresponding duration, as shown in the load test schedule, shall be included in the test data.

MEASUREMENT AND PAYMENT

Micropiles will be measured and paid for by the unit.

Micropiling for performance testing, including anchor piles, will be paid for as micropiles.

The contract unit price paid for micropile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing micropiles, including casings, grout, reinforcement, cutting tips, drill bits, pile anchorage, and disposing of materials resulting from pile installation, 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 performance testing and proof testing of micropiles and cutting off piles as required, including all labor, materials, tools, equipment, and incidentals shall be considered as included in the contract unit price paid for micropile and no additional compensation will be allowed therefor.

Full compensation for excavation of pile load test sites, for maintaining a level and dewatered test site, and for backfilling and completely restoring the test sites shall be considered as included in the contract unit price paid for micropile and no additional compensation will be allowed therefor.

No payment will be made for micropiles which are damaged either during installation or after the micropiles are complete in place. No payment will be made for additional excavation, backfill, concrete, reinforcement, nor other costs incurred from footing enlargement resulting from replacing rejected micropiles.

Alternative piling will be paid by the unit as alternative piling. The quantities for alternative piles will be computed on the basis of the dimensions and details for the type of State designed piling shown on the plans, and payment will be made based on the quantities shown in the Engineer's Estimate for said piling. No change in the quantities to be paid for will be made because of the use by the Contractor of alternative piling.

Full compensation for furnishing and installing casings, shells, prestressing system, grout, concrete, reinforcement, cutting tips, drill bits, and any other material used in furnishing and installing the alternative piles shall be considered as included in the contract price paid for the State designed piling of the type shown on the plans and in the Engineer's Estimate, and no additional compensation will be allowed therefor.

Full compensation for driving, jetting, drilling, vibrating, prestressing, removal of casings, and for disposal of material resulting from alternative pile installation, including performance and proof testing alternative piling shall be considered as included in the contract price paid for the State designed piling of the type shown on the plans and in the Engineer's Estimate, and no additional compensation will be allowed therefor.

Full compensation for revisions to other facilities made necessary by the use of an alternative pile shall be considered as included in the contract price paid for the State designed piling of the type shown on the plans and in the Engineer's Estimate, and no separate payment will be made therefor.

Full compensation for system, performance, and proof testing alternative piling, including placing additional reinforcement, load test anchorage, and for cutting off piles as specified, shall be considered as included in the contract price paid for the State designed piling of the type shown on the plans and in the Engineer's Estimate, and no additional compensation will be allowed therefor.

No payment will be made for alternative piles which fail to meet any of the acceptance criteria.

No compensation will be made for additional excavation, backfill, concrete, reinforcement, nor any other costs incurred from footing enlargement resulting from replacing rejected alternative piles or for placing additional alternative piling in footings with piles that failed to meet the specified testing requirements.

The quantities of earthwork, concrete, and reinforcement will be computed on the basis of the dimensions and details for the State designed pile footing shown on the plans, and payment will be made based on the quantities shown in the Engineer's Estimate. No change in the quantities of earthwork, concrete, and reinforcement to be paid for will be made because of the use by the Contractor of alternative pile footings.

Sections 4-1.03B, "Increased or Decreased Quantities," 4-1.03B(1), "Increases of more than 25 Percent, "4-1.03B(2), "Decreases of more than 25 Percent, " and 4-1.03C, "Changes in Character of Work," of the Standard Specifications shall not apply to piles listed under "Alternative Piling" of these special provisions.

10-1.63 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

GENERAL

Attention is directed to Sections "Working Drawings," "Order of Work," and "Falsework," of these special provisions.

Prestressing concrete shall consist of the following items as designated in the Engineer's Estimates:

A. Prestressing, Longitudinal
   Prestressing cast-in-place girders and deck slabs, as shown on the plans.
B. Prestressing, Transverse
   Prestressing cast-in-place pier caps shown on the plans.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a bonded full length draped tendon prestressing system. For these bridges the Contractor may, in conformance with the provisions in "Cost Reduction Incentive Proposals," of these special provisions, propose an alternative prestressing system utilizing bonded partial length tendons provided the proposed system and associated details meet the following requirements:

A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans and the Contractor shall demonstrate that tensile cracking will not be induced in the structure at the termination points of partial length tendons.
B. The concrete strength shall not be less than that shown on the plans.
C. Not less than 35 percent of the total prestressing force at any section shall be provided by full length draped tendons.
D. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
E. Temporary prestressing tendons, if used, shall be detensioned, and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
F. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with "Working Drawings," of these special provisions. Calculations and working drawings shall be stamped by an engineer who is registered as a Civil Engineer in the State of California.

PAYMENT

The contract lump sum price paid for prestressing concrete of the types shown 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 post-tensioning the cast-in-place concrete structures, 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 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Replace paragraphs 2 through 4, Section 51-1.13, "Bonding," of the Standard Specifications with the following:

1. Surfaces of fresh concrete at horizontal construction joints shall be thoroughly consolidated without completely removing surface irregularities. Additionally, surfaces of fresh concrete at horizontal construction joints between girder stems and decks shall be roughened to at least a 6 mm amplitude.
2. Construction joint surfaces shall be cleaned of surface laitance, curing compound, and other foreign materials using abrasive blast methods before fresh concrete is placed against the joint surface.
3. Construction joint surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately before placing concrete.

GENERAL

Attention is directed to "Precast Concrete Quality Control" of these special provisions.

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

Neoprene strip shall be furnished and installed at abutment backwall joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Forms used to support the deck of cast-in-place box girders for the Oakland Approach Structures may remain in place, provided the forming system employed leaves no sharp projections into the cells or voids, and the portions of the forms in cells containing utility facilities are removed completely from the cells. The forms between hinges and 1.5 m beyond access openings adjacent to hinges shall be removed.

Surfaces to receive Class 1 finish in conformance with section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications shall include undersurfaces of box girder spans.

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the details shown on the plans.

Deck access openings and pull box openings in bridge decks shall conform to the details shown on the plans.

The Contractor shall provide adequate temporary bridging at existing hinges FW, EW, FE, and EE to accommodate deck smoothness testing and grinding across the hinges. Smoothness testing of existing deck surfaces will be performed by the Engineer. Grinding shall be done 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.

DECK SURFACE TEXTURE

Attention is directed to Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications.

New bridge deck surfaces shall be textured by grooving.

Grooves shall be made parallel to the centerline of the traffic lane and shall be within 150 mm from the layout line for the toe of the concrete barrier.

Grooving of the concrete deck surface shall conform to one of the following methods:

A. Grooving operations shall conform to the requirements in Section 42-1, "Grooving," of the Standard Specifications.
B. Grooves shall be made with spring steel tines. Spring steel tines of the final texturing device shall be rectangular in cross section, 2 mm to 4 mm wide, on 19 mm to 24 mm centers, and of sufficient length, thickness and resilience to form grooves approximately 5 mm deep in the fresh concrete surface. Final texture shall be uniform in appearance and longitudinal grooves shall have a depth between 2 mm and 8 mm.

Grooving shall be done in such a manner as to prevent the texture device from tearing the surface or causing the visible separation of coarse aggregate at the surface.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work," and "Jacking Superstructure," of these special provisions.

Falsework shall provide adequate space for the jack installation at Temporary Bent E19AR and operation at the locations shown on the plans. Falsework shall be designed to resist the jacking force as shown on the plans.

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
Oakland Approach Structure – Phase 2 34-0006R	5

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.

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 (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES

Except as provided herein, cast-in-place prestressed box girder bridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in "Cost Reduction Incentive Proposals," of these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to: California Department of Transportation, Office of the Resident Engineer, Contract 04-0120M4, 345 Burma Road, Oakland, CA 94607. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Office of Structure Design for final approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m^2 (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 12 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department. The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the number of girders, (3) the amount and location of reinforcing steel, and (4) the amount and location of prestressing force in the superstructure. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 48 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided by full length draped tendons are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure. Connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

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 furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges 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.

Full compensation for producing Class 1 surface finish on the undersurfaces of box girder spans 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.

Full compensation for conforming to the provisions in "Deck Surface Texture" of these special provisions 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.

Full compensation for filling blockouts for seismic joint with grout as shown on the plans 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.

Curb and sidewalk at outfall bridge at west end maintenance yard will be measured and paid for as structural concrete, bridge.

The contract price paid per cubic meter for leveling concrete shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing leveling concrete, complete in place, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

The contract price paid per cubic meter for structural concrete, bikepath shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing concrete for edge beams, bikepath beam supports, and cast-in-place slab, complete in place, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

Structural concrete, barrier slab (Type 1) and structural concrete, barrier slab (Type 2) will be measured and paid for as structural concrete, barrier slab.

The contract price paid per cubic meter for structural concrete, barrier slab shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the barrier slab (at precast walls), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.65 UTILITY VAULT

Utility vaults, consisting of precast reinforced concrete sections and miscellaneous bridge metal, shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

Checkered plate covers, rolled sections, and anchorage assemblies shall conform to the provisions in "Miscellaneous Bridge Metal," of these special provisions.

Utility vaults will be measured and paid for by the unit.

The contract unit price paid for utility vault shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and erecting utility vault, complete in place, including furnishing and placing all bar reinforcing steel, miscellaneous bridge metal, and premolded expansion joint filler, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.66 PRECAST WALL

Precast wall with barrier slab, consisting of precast reinforced concrete wall panels, leveling pad and reinforcement extending into lightweight embankment material (cellular concrete), and reinforced concrete barrier slab shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

Barrier slab shall conform to the details shown on the plans, and the provisions "Concrete Structures," of these special provisions.

Attention is directed to "Precast Concrete Quality Control" of these special provisions.

Attention is directed to "Lightweight Embankment Material (Cellular Concrete)," of these special provisions.

WORKING DRAWINGS

The Contractor shall submit to the Engineer working drawings for precast wall in accordance with the requirements in "Working Drawings," of these special provisions.

The working drawings shall include, but not be limited to, the following:

A. The erection sequence, including staging of precast wall erection operations and installation of reinforcement extending into lightweight embankment material (cellular concrete).
B. Detailed dimensions of each panel.
C. Lifting insert locations and details.
D. Measures to assure that exterior surfaces and exposed reinforcement will be protected during storage, transportation and placement of the precast wall panels.
E. Detailed temporary bracing plans.

Temporary bracing shall be provided, as necessary, for the precast wall to remain plumb and to withstand all imposed loads during placement of lightweight embankment material (cellular concrete). The working drawings shall show provisions for the temporary bracing or methods to be used to conform to this requirement during each phase of construction. Wind loads shall be included in the design of the bracing or methods.

Temporary bracing shall be designed and constructed in conformance with the provisions in Section 51-1.06, "Falsework," of the Standard Specifications.

The falsework design calculations shall show the stresses and deflections in load supporting members.

The temporary bracing design calculations shall show the stresses and deflections in the precast panels.

After complete working drawings are received by the Engineer, the Contractor shall allow the Engineer 30 days to review the submittal. No fabrication of the precast wall shall begin until complete working drawings are reviewed and approved, in writing, by the Engineer.

MATERIALS

Concrete

The concrete leveling pads for the precast wall shall conform to the provisions in Section 51- 1.02 "Minor Structures," of of the Standard Specifications.

Reinforcement

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

MW70 and MW130 steel wire shall conform to the requirements in ASTM Designation: A 82/A 82M. The welded wire mat shall conform to the requirements in ASTM Designation: A 185/A 185M. MD70 and MD130 deformed steel wire may be substituted for MW70 and MW130 steel wire, respectively. The welded wire mat utilizing deformed steel wire shall conform to the requirements in ASTM Designation: A 496/A 496M and ASTM Designation: A 497/A 497M.

The button on button-head wires shall conform to the provisions in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

The coupler at the wire mat connection shall be a seamless steel sleeve. The coupler shall be applied over the button-head wires and swaged by means of a hydraulic press. The coupler shall develop the minimum tensile strength of the wire without exceeding a total slip of the wires of 5.0 mm.

Splicing of the welded wire mat along its length shall be by mechanical coupler that shall develop the minimum tensile strength of the wire. The mechanical coupler shall be approved by the Engineer.

CONSTRUCTION

Precast wall shall be constructed to the lines, grades, and details shown on the plans, and shall conform to these special provisions.

Structure backfill material around reinforced concrete leveling pad shall be placed and compacted to a relative compaction of not less than 95 percent prior to installation of precast wall.

Vertical and horizontal alignment tolerances of panels shall not exceed 20 mm when measured along a 3 m straight edge. The maximum allowable offset in any panel joint shall not exceed 20 mm.

Welded wire mat shall be tensioned in the direction perpendicular to the wall face with enough force to remove any slack in the connection or in the welded wire mat itself. Welded wire mat shall be secured in place to prevent movement during placement of lightweight embankment material (cellular concrete).

Threaded studs shall not be installed more than 30 days prior to the placement of the lightweight embankment material (cellular concrete).

Concrete

Concrete for the leveling pads shall be placed at least 24 hours prior to erecting face panels.

Exposed surfaces of precast wall (Type 2) panels and transition precast wall panels shall receive a surface finish conforming to the provisions in Section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications.

Attention is directed to "Architectural Surface (Textured Concrete)," of these special provisions, regarding the architectural treatment for precast wall (Type 1).

MEASUREMENT AND PAYMENT

Precast wall will be measured and paid for by the square meter based on the length and vertical height of each section of wall shown on the plans. The vertical height of each section will be taken as the difference in elevation on the outer face from the bottom of the lowermost face element to the top of wall profile.

The contract price paid per square meter for precast wall of the types 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 furnishing and erecting the precast wall, including working drawings, leveling pad, bar reinforcement steel, welded wire connector mat, welded wire mat, and cast in place concrete inserts, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Transition wall panel will be measured and paid for as precast wall (Type 2).

The contract price paid per cubic meter for structural concrete, barrier slab shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the barrier slab, regardless of type, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.67 PRECAST CONCRETE SLAB (BIKEPATH)

Precast concrete slab (bikepath) shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

The Contractor shall submit to the Engineer working drawings for precast concrete slab in accordance with the requirements in "Working Drawings" of these special provisions. The number of sets of drawings and times for review shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications. The working drawings shall include, but not be limited to, the following:

A. Erection plans showing the placement sequence and location of each individual slab.
B. Detailed dimensions of each slab.
C. Reinforcement placement details.
D. Lifting insert locations and details.

Grout shall conform to the requirements in Section 51-1.13, "Bonding," of the Standard Specifications.

Except where otherwise shown on the plans, the top surface of the slab shall be given a coarse texture by brooming with a stiff bristled broom or by other suitable devices which will result in uniform transverse scoring, in advance of curing operations. The requirements of the seventh paragraph of Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications shall not apply.

After the concrete slabs are in final position, the closure pour shall be placed.

Longitudinal joints shall be filled with grout as shown on the plans.

No equipment or other loads will be allowed on spans until at least 72 hours after the closure pour has been placed and the last grout has been placed in the longitudinal joints.

BIKEPATH GRATINGS

Bikepath gratings shall be in conformance with the requirements of Section 56-1.02F "Steel Walkway Gratings" of the Standard Specifications.

Attention is directed to "Welding" of these special provisions.

Hardware for attachment of bikepath steel gratings to stainless steel angles shall be fabricated from stainless steel conforming to the requirements of ASTM Designation: A 276, Type 316.

PAYMENT

Full compensation for furnishing and placing closure pours, grout at joints, neoprene pad, and leveling grout pads shall be considered as included in the contract unit prices paid for furnishing and erecting the precast concrete slab (bikepath) and no additional compensation will be allowed therefor.

Full compensation for furnishing and installing bikepath steel gratings, support angles and attachment assemblies, including removal of temporary cover, shall be considered as included in the contract unit prices paid for furnishing and erecting the precast concrete slab (bikepath) and no additional compensation will be allowed therefor.

10-1.68 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 SO_4, 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.

10-1.69 ROADWAY LIGHT POLE FOUNDATION (BRIDGE)

This work shall consist of constructing roadway light pole foundations (bridge) for roadway light poles and fixtures in conformance with the details and locations as shown on the plans, and as specified in these special provisions.

Concrete and reinforcement for roadway light pole foundations (bridge) shall conform to "Concrete Structures," and "Reinforcement," of these special provisions.

Anchor bolts not designated on the plans as high strength (HS) or stainless steel shall conform to the requirements in ASTM Designation: F 1554, Grade 36. High strength anchor bolts shall conform to the requirements in ASTM Designation: F 1554, Grade 105.

Anchor bolts shall be placed in proper position and to proper height and alignment, and shall be held in place by means of a template.

One double heavy hex nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt. The Contractor shall provide temporary protection, as determined by the Engineer, of exposed bolt threads for each bolt.

All ferrous metal parts shall be galvanized and shall not be painted.

Full compensation for constructing roadway light pole foundations (bridge) including furnishing and installing anchor bolts, leveling nuts, double heavy hex nuts, washers and temporary removable timber template, including temporary protection of anchor bolt threads, 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.

10-1.70 INSTALL SEISMIC JOINT (ABUTMENT E23R)

This work shall consist of inspection, shipping and installation of State-furnished seismic joint in Abutment E23R in conformance with the details shown on the plans and the requirements of these special provisions.

The Contractor's attention is directed to section "State-Furnished Materials" of these special provisions.

The seismic joint consists of steel deck plates, channel assemblies, support plates, sealing elements, and anchorage components as shown on the plans.

WORKING DRAWINGS

The Contractor shall submit working drawings in conformance with the provisions in "Working Drawings," of these special provisions, and the requirements specified herein.

Working drawings shall include the method, materials, equipment, and procedures for installation that the Contractor proposes to use.

Working drawing submittals shall include the following:

A. Joint installation plans for strip seals including methods, materials and equipment to be used.
B Joint installation plans including methods, materials, equipment, sequence, lifting mechanisms and locations, details of temporary anchorage during setting, temperature adjustment devices, method for maintaining full contact between deck plates and support plates during and after installation, installation details at curbs, seal installation details, and other procedures that the Contractor proposes to use for installation of the seismic joints.
C. Fast setting hydraulic cement concrete mix design and placement procedures. The Contractor's proposed fast setting hydraulic cement concrete mix design submittals shall be as specified in "Fast Setting Hydraulic Cement Concrete" in these special provisions.
D. Elastomeric concrete technical information. Technical information shall be furnished from the manufacturer elastomeric concrete proposed for use in the work.
E. Self-consolidating concrete mix design and placement procedures. The Contractor's proposed self-consolidating concrete mix design submittals shall include test results for slump flow, slump flow time to a 500 mm diameter, stability of the concrete mixture, and compressive strengths at 7 and 28 days.
F. Details and procedures of the mock-up construction to demonstrate self-consolidating concrete.
G. Anchorage components including concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans.
H. Storage plans for interim storage, and on-site storage details including temporary support for the seismic joints.
I. Shipping plans including handling of the seismic joints during transportation.

The final approval of the Contractor's mix design for self-consolidating concrete is contingent upon the successful mock-up construction as specified in "Demonstration Pours" herein.

MATERIALS

Concrete for filling blockouts shall conform to the requirements in "Fast Setting Hydraulic Cement Concrete," "Elastomeric Concrete," and "Self-Consolidating Concrete" of these special provisions.

Neoprene sheet shall conform to Section 51-1.145, "Strip Waterstops," of the Standard Specifications.

Elastomeric washers shall conform to the requirements specified in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications.

Sealing elements shall conform to the requirements in "Sealing Elements" of these special provisions.

Reinforcing steel shall conform to the provisions in "Reinforcement" of these special provisions.

Fast Setting Hydraulic Cement Concrete

Fast setting hydraulic cement concrete shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Fast Setting Hydraulic Cement Concrete (FSHCC) shall consist of hydraulic cement, conforming to the requirements below, aggregate, and any admixtures used. The combined aggregate grading used in FSHCC shall be any of the maximum size grading limits specified in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications. The minimum 3 hour compressive strength shall be 14 MPa and the minimum 56 day compressive strength shall be 35 MPa.

FSHCC shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications, except that any cement meeting the requirements specified in ASTM Designation: C 219 and conforming to the following requirements may be used.

TEST DESCRIPTION	REQUIREMENT	TEST METHOD
Contraction in Air	0.053 %, max.	California Test 527, W/C Ratio = 0.39 ± 0.010
Mortar Expansion in Water	0.04 %, max.	ASTM Designation: C 1038
Soluble Chloride*	0.05 %, max.	California Test 422
Soluble Sulfates*	0.30 %, max.	California Test 417
Thermal Stability	90 %, min.	California Test 553
Compressive Strength @ 3 days	17 MPa	ASTM Designation: C 109

*Test is to be done on 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

Type C accelerating chemical admixtures conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications may be used. In addition to the admixtures listed on the Department's current list of approved admixtures, citric acid or borax may be used if requested in writing by the cement manufacturer and a sample is submitted to the Engineer. Chemical admixtures, if used, shall be included in the testing for requirements listed in the table above.

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

The Contractor shall submit mix designs that include the following:

A. Compressive Strength, at 3 hours, 24 hours, 3 days, 7 days, 28 days and 56 days.
B. Proposed aggregate grading
C. Mix proportions of hydraulic cement, aggregate and water
D. Types and amounts of chemical admixtures, if used
E. Initial and Final set time of a 300mm x 300mm x 138mm concrete block curing at 21 ± 5ºC ambient temperature.
F. Range of ambient temperatures over which the mix design will achieve the required minimum 3 hour and 56 day compressive strengths.

At the Contractor's option, more than one mix design may be submitted to account for ambient temperature variations that exceed the ranges specified herein.

FSHCC shall be proportioned and placed by volumetric continuous mixers capable of proportioning cement, water, aggregate and admixtures by volume. Identifying numbers or letters of volumetric continuous mixers shall be located on the front or rear of the equipment. Calibration of the volumetric continuous mixers shall be performed demonstrating that the equipment is capable of delivering the proportioned concrete material per the approved mix design. The volumetric continuous mixers shall produce a log of production data, at no less than 20 minute intervals, showing the proportions of cement, aggregate and water dispatched.

The Contractor shall furnish aggregate moisture determinations per California Test Method 223. During actual placement the percent fine aggregate moisture content to be used shall be limited to a maximum value of 2% more than moisture content determined during calibration.

The aggregate and cement proportioning calibrations shall be determined by weight.

The first 3 volumetric continuous mixers to be used during actual production at the site shall be loaded with all material at least 4 hours prior to placement. A trial mix to be disposed of by the Contractor shall be batched for the Engineer's inspection. The mix size shall be from a minimum 20 second operation of the mixer. At 3 hours after discharge the batched material shall be visibly hard indicating at least a final set.

After the calibration and acceptance of the use of a volumetric continuous mixer, water to account for any allowable change in fine aggregate moisture content may be adjusted just prior to placement. Only the water reducer admixtures, if used, may be adjusted during actual placement.

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 each delivery of aggregate, cement, and admixtures used for calibration tests and shall be submitted to the Engineer with a certified copy of the mass of each delivery.

The concrete curing method shall be as recommended by the manufacturer of the cement and as approved by the Engineer.

Elastomeric Concrete

Elastomeric concrete shall be a polymer binder material mixed with fiberglass fibers and natural sand. The polymer binder shall be polyurethane, or epoxy, or a combination of epoxy and polyurethane. Elastomeric concrete shall formulated to be flexible, have high load bearing capacity and be resistant to spalling and cracking.

The Contractor shall furnish and install elastomeric concrete as shown on the plans and in conformance with these special provisions.

Elastomeric concrete shall be mixed, placed, and cured as recommended by the manufacturer, and as approved by the Engineer. A representative of the elastomeric concrete manufacturer shall be present during mixing and placement of elastomeric concrete.

The elastomeric concrete (binder and aggregate) shall have the following physical properties:

ELASTOMERIC CONCRETE (BINDER AND AGGREGATE)		
PROPERTY	REQUIREMENT	TEST METHOD
* Modulus of Elasticity	2000 MPa, maximum, at 24 hours at 21°± 2°C followed by 13 days at 38°± 2°C	California Test 551
* Compressive Stress	7.0 MPa, minimum, at 24 hours at 21°± 2°C followed by 13 days at 38°± 2°C	California Test 551 (Machine crosshead speed @1.3mm per minute.)
* Impact	4 intervals with no cracks, minimum	Ball Drop*
PCC Saturated Surface-Dry Bond Strength	2.1 MPa, minimum at 24 hours and 21 ± 1°C	California Test 551
* Test specimen is a cast disk 63.5 mm in diameter and 9.5 mm thick. Specimens are conditioned four hours at test temperatures of: 40 C (± 2 C), 20 C (± 2 C), 10 C (± 2 C), & 0 C (± 2 C). A 0.45 kg steel ball is dropped onto the center of the specimen through a plastic guiding tube from an initial height of 1500 mm. The drop height is increased by 150 mm intervals.		

The polymer binder shall have the following physical properties:

POLYMER BINDER		
PROPERTY	REQUIREMENT	TEST METHOD
Tensile Strength	3.45 MPa, minimum, at 7 days at 38°± 1°C	ASTM D 412
	3.45 MPa s , minimum, at 24 hours at 21°± 1°C followed by 13 days at 70°± 2°C	ASTM D 412
Elongation	180 percent, minimum, at 7 days at 38°± 1°C	ASTM D 412
	180 percent, minimum, at 24 hours at 21°± 1°C followed by 13 days at 70°± 2°C	ASTM D 412
Hardness, Type D Durometer, points	45, minimum, at 7 days at 38°± 1°C	ASTM D 2240
	45 points, minimum, at 24 hours at 21°± 1°C followed by 13 days at 70°± 2°C	ASTM D 2240

Elastomeric concrete shall not be used until the Engineer has approved the elastomeric concrete submittal in writing, has inspected the materials, and the manufacturer's technical representative has instructed the Contractor and Engineer in the surface preparation, mixing and application of the elastomeric concrete.

At a minimum, cleaning of the contact surfaces of existing concrete shall be accomplished by abrasive blast cleaning. The concrete and any exposed reinforcing steel shall be free of all rust, paint, grease, asphalt or other foreign materials. Steel contact surfaces shall be cleaned by methods approved by the Engineer to remove all rust, paint, grease, or other foreign materials. Immediately prior to placing the elastomeric concrete, the surfaces shall be re-cleaned by sweeping and pressure jetting, or by other approved means, as necessary to remove any debris which has accumulated during construction or after abrasive blast cleaning. The surface temperature of the areas to be covered shall be within the manufacturer's recommendations when the elastomeric concrete is placed. Methods proposed to heat said surfaces are subject to approval by the Engineer.

Self-Consolidating Concrete

Self-consolidating concrete shall be flowing concrete capable of spreading without segregation to a level state without the use of internal or external vibrators. Self-consolidating concrete shall conform to "Concrete Structures" of these special provisions and the requirements specified herein.

In addition to the chemical admixtures listed on the Department's current list of approved brands of admixtures that may be used, the Contractor may use a viscosity modifying admixture made by a chemical admixture manufacturer for the purpose of producing a self-consolidating concrete. The use of the viscosity modifying admixture shall be in accordance with the manufacturer's recommendations. The combined aggregate grading shall be any of the four maximum size grading limits specified in Section 90-3.04, "Combined Aggregate Gradings," of the Standard Specifications.

The Contractor's proposed mix design shall be pre-qualified for use in the demonstration pour by trial batch reports in conformance with Section 90-9 "Compressive Strength," of the Standard Specifications except that the consistency shall be measured by the slump flow test and bleeding shall be measured by ASTM Designation, C 232, Method A. The slump flow test shall conform to the requirements in ASTM Designation: C 143 except the following:

A. The cone shall be filled in one lift without rodding. The cone shall be placed on a flat, moist, nonabsorbent, rigid base plate that is at least 700mm x 700 mm. The base plate shall have concentric circle marks showing 200-mm and 500-mm diameter circles.
B. Measure the time it takes for the concrete to reach 500 mm diameter circle. Report this as "Slump Flow Time" to the nearest 0.5 seconds.
C. After the concrete ceases to flow, measure the diameter in two perpendicular directions. Report this as "Slump Flow" to the nearest 5 mm.
D. Visually inspect the concrete spread to observe the distribution of coarse aggregate throughout the spread. Measure and record the radial width of any mortar ring without coarse aggregate. If no mortar ring without coarse aggregate exists, report as zero.

Consistency of the self-consolidating concrete shall be determined using the slump flow test method. The self-consolidating concrete shall have a minimum slump flow of 550 mm without segregation. The slump flow shall be selected by the Contractor based on the concrete constituent materials and placement procedures as specified in the approved working drawings.

The percent bleeding shall not exceed 1.5% when determined by ASTM Designation, C 232, Method A except that the container shall be filled in one lift without rodding.

Amendment to California Test 540

The following amendments to California Test 540, "Method of Making, Handling, and Storing Concrete Compressive Test Specimens in the Field," shall only apply to self-consolidating concrete. The Items "a" and "b" under "2. Test Specimen Fabrication" of "C. Preparation of Test Specimens" of California Test 540 shall be amended to read:

A. Place test molds on a firm, flat surface to prevent distortion of the bottom surface. When more than one specimen is to be made from the same batch, make all specimens simultaneously. Fill the mold in one lift with a circular motion of the scoop to distribute the concrete evenly in the mold. Pat sides of the mold lightly by hand, or jig by rocking the mold from side to side.
B. After the sides of the mold have been patted, strike off the surface of the concrete even with the top edge of the mold. Wipe the sides of the mold free of excess concrete and press the lid on to prevent evaporation.

Demonstration Pours

Prior to placing self-consolidating concrete, the Contractor shall construct at least one mock-up to demonstrate that the concrete will flow for the distance required by the proposed construction procedure. The placement of the self-consolidating concrete in the mock-up shall be witnessed by the Engineer.

The mock-up shall have a depth and length equal to that of the blockout detailed on the plans. The width of the mock-up shall be selected by the Contractor based on the distance that the concrete is required to flow according to the proposed construction procedure but shall not be less than 2 meters. The mock-up shall include concrete, reinforcement, and all concrete embedments as shown on the plans and approved working drawings, except that all reinforcement and embedments shall stop 300 mm from both longitudinal ends of the blockout so that concrete can be removed later and tested for segregation. The mock-up shall be covered with removable 27 mm plus or minus 3 mm thick transparent plastic top plate. The Contractor may submit a proposal for approval using multiple transparent plastic top plates to cover the mock-up instead of a single top plate provided that the plates are adequately tied together and are watertight at the vertical edges where joined together as determined by the Engineer. The plastic top plate shall have vent holes of the same size and spacing as those in the support plate.

Acceptance criteria of the self-consolidating concrete shall be as follows:

A. Self-consolidating concrete shall flow under the plastic top plate and shall completely fill the void in the blockout.
B. After consolidation against the plastic top plate is verified, the Contractor shall remove the plastic top plate and shall take a sample of at least 45 kg of concrete from each end of the blockout to check for segregation by comparing coarse aggregate content with mix design values. The coarse aggregate content of each sample shall be determined using California Test 529 and shall not differ from the mix design value by more than 110 kg/m^3.
C. The percent bleeding shall not exceed 1.5% when determined by ASTM Designation, C 232, Method A except that the container shall be filled in one lift without rodding.

If the concrete fails to meet any of the acceptance criteria as determined by the Engineer, additional mock-ups shall be constructed at the Contractor's expense.

The mock-up shall not be part of the permanent structure and shall become the property of the Contractor. The mock-up shall be removed from the work site 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.

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.

Sealing Elements

Sealing elements shall conform to the details shown on the plans and shall be continuous without splices.

Silicone sealing elements shall be 2 component silicone sealant that meets the requirements of Type A and AL seal in Section, 51-1.12F(3), "Materials and Installation," of the Standard Specifications.

Strip seal shall consist of a sealing membrane mechanically locked between two steel members and shall be either of the following systems:

Proprietary Strip Sealing System	Address and Phone Number
WaboCrete Strip Seal System (Type E)	Watson Bowman Acme Corporation 95 Pineview Drive Amherst, N.Y. 14228 (800) 677-4922 www.wbacorp.com
Steelflex Strip Seal Expansion Joint System (Type SSE2)	The D. S. Brown Company 300 E. Cherry Street North Baltimore, OH 45872 (419) 257-3561 www.dsbrown.com

Damage to the seismic joint during shipping or handling shall be cause for rejection of the seismic joint.

Damage to the corrosion protection system shall be repaired to the satisfaction of the Engineer prior to installation.

STORAGE, TRANSPORATION, AND HANDLING

The seismic joint is stored at a storage facility within 25 km of the San Francisco-Oakland Bay Bridge Toll Plaza. The Contractor shall notify the Engineer at least two weeks prior to pick-up of the seismic joint from storage.

Prior to transporting the seismic joint to the bridge site, the Contractor shall inspect the seismic joint for damage at the storage location. The Contractor shall furnish to the Engineer a seismic joint inspection report. The inspection report shall include the condition of the seismic joint and any existing damages that may have occurred prior to the Contractor's receiving the seismic joint. If no damage is found, the Contractor shall include a statement in the inspection report to state that the seismic joint is in good condition and acceptable for delivery and installation.

Damage to the seismic joint during transportation or handling shall be cause for rejection of the seismic joint.

INSTALLATION

Each seismic joint shall be installed in accordance with the approved working drawings.

The maximum gap between sliding surfaces shall not exceed 2 mm in any unloaded position.

Each seismic joint deck plate shall be installed such that there is no offset in alignment between adjacent plates along the edge surface where strip seal is to be placed.

Each installed seismic joint shall match the finished roadway profile and grades as shown on the plans.

The Contractor shall protect the seismic joint from damage. The Contractor shall protect concrete blockouts and support systems from damage and construction traffic prior to installation of the seismic joints.

Sealing elements not fully bonded to the steel extrusions shall be replaced by the Contractor at the Contractor's expense.

PAYMENT

The contract lump sum price paid for install seismic joint (abutment E23R) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in transporting, storing, and installing the seismic joint, including fast setting hydraulic cement concrete, self-consolidating concrete, elastomeric concrete, bar reinforcing steel, neoprene sheets, elastomeric washers, anchorage components, mock-up construction, protecting and repairing joint surfaces, and sealing elements, including silicone seals and strip seals, 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 drilling holes, including coring through reinforcement when approved by the Engineer, and bonding dowels shall be considered as included in the contract lump sum price paid for install seismic joint (abutment E23R) and no separate payment will be made therefor.

10-1.71 PTFE SPHERICAL BEARING

PTFE spherical bearings, consisting of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates and anchors, shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

PTFE spherical bearings shall be expansion type with spherical and sliding bearing surfaces.

The manufacturer of the PTFE spherical bearings shall show evidence that PTFE spherical bearings furnished by the same manufacturer and used in conditions similar to this application have had at least 3 years of satisfactory service at each of 2 projects.

A qualified representative of the manufacturer shall be present during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit working drawings of the PTFE spherical bearings to the Engineer for approval in conformance with the provisions in "Working Drawings," of these special provisions.

The working drawings for PTFE spherical bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate for the PTFE bearing sole plate during concrete placement.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work but in no case shall the time be less than 6 weeks after complete drawings and all support data are submitted.

At the completion of each structure on the contract, one set of 279 mm x 432 mm prints on 75-g/m^2 (minimum) bond paper of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints of drawings that are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

PTFE spherical bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications.

The manufacturer shall furnish Certificates of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE spherical bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

PTFE surfaces of PTFE spherical bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 4441.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316 with a minimum thickness of 3.2 mm.

Curved stainless steel surfaces shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316.

Curved stainless steel surfaces with dimensions shown on the plans exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 316. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding, and polishing.

When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709M, Grade 36 [250], 50 [345], or 50W [345W].

Stud connectors shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

Convex plate radius dimension tolerances shall be 0.000 to -250 µm. Concave plate radius dimensions shall be +250 to 0.000 µm.

The bearing manufacturer shall have full size convex and concave metal templates for the 2 spherical surfaces of each bearing radius. The templates shall be available to the inspector during all bearing inspections.

The PTFE fabric on spherical or sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the spherical concave surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed on the concave surface. Any edges other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing.

The mating surface of the flat stainless steel with the PTFE surfacing shall have a minimum #8 mirror finish as determined in conformance with the requirements in ANSI Standard B46.1. The mating surface of the curved stainless steel with the PTFE surfacing shall have a finish of less than 0.4 µm root-mean-square (rms), as determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere and in contact with the structure of the completed work, except stainless steel surfaces, shall be cleaned and painted in conformance with the provisions in "Clean and Paint PTFE Bearings" of these special provisions.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps that are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

PTFE spherical bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearing during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE spherical bearing after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE spherical bearings shall have a first movement static coefficient of friction not exceeding 0.06.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE spherical bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests cannot be performed at the specified load, the Contractor shall submit to the Engineer for review and approval a testing plan listing additional physical tests. These tests shall be performed in the presence of the Engineer and shall demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE spherical bearings shall conform to the following requirements:

A. One bearing per lot of production bearings shall be proof tested. A lot is defined as 25 bearings or fraction thereof of the same type, within a load category. Bearings in 2 load categories with vertical load capacities within 800 kN of each other will be considered in one load category for testing.
B. Expansion type bearings shall be proof tested for compression and coefficient of friction.
C. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:

    1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
    2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
    3. Bearings with more than 8900 kN maximum vertical load capacity.

D. Proof tests for compression: The bearing shall be held at the design rotation or 0.02 radians, whichever is greater, for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading.

E. Proof tests for coefficient of friction: The tests shall be performed at the minimum vertical load shown on the plans for the bearing with the test load applied for 12 hours prior to friction measurement and the following:

1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeters per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.

F. The bearing surfaces shall be cleaned prior to proof testing.
G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at 21°±8°C.
H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Quantities of PTFE spherical bearings will be determined as units from actual count in the completed work. A PTFE spherical bearing with more than one PTFE surface shall be considered a single PTFE spherical bearing.

The contract unit price paid for PTFE spherical bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, mortaring of bolts, temporary supports, proof testing, and cleaning and painting of PTFE spherical bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of PTFE spherical bearings are either fabricated or tested at a site 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 extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for PTFE spherical bearings will be reduced $5,000 for each fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional $10,000 ($15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

10-1.72 BIKEPATH EXPANSION JOINT

Bikepath expansion joint, consisting of structural steel plates with bonded ultra high molecular weight (UHMW) strips, structural steel shapes, stainless steel plates, stainless steel bolts, and headed steel anchors shall conform to the details shown on the plans and these special provisions.

The metal components of the bikepath expansion joints shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and "Miscellaneous Metal (Bridge)" of these special provisions.

The manufacturer shall furnish certificates of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the bikepath expansion joint.

The UHMW strips shall have a molecular weight of 3,000,000 to 6,000,000 in accordance with ASTM Designation: D 4020, compression molded, stress relieved, and include an ultraviolet stabilizer. Physical characteristics shall conform to the following requirements:

A. Static coefficient of friction to steel (dry) shall be less than 0.025.
B. Specific gravity shall be greater than 0.92 (ASTM Designation: D 792)
C. No water absorption shall be shown under long term immersion (ASTM Designation: D 510)
D. The minimum tensile stress capacity shall be 25 MPa and the minimum impact shear capacity shall be 10 MPa.

Bonding of UHMW surfaces to the underside of steel plates shall conform to similar bonding requirements for "PTFE Spherical Bearing" of these special provisions.

NONSKID SURFACE

Where shown on the plans, steel plates shall receive a nonskid surface consisting of epoxy mixed with grit. Epoxy shall conform to the provisions in Section 95, "Epoxy," of the Standard Specifications.

Epoxy shall consist of epoxy conforming to the provisions in either Section 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-01F-03)," or Section 95-2.09, "Epoxy Sealant for Inductive Loops (State Specification 8040-31D-06)," of the Standard Specifications.

Grit shall consist of commercial quality aluminum oxide, silicon carbide, or almandite garnet grit particles, screen size 1.7 m to 600 µm or 1.4 m to 500 µm, applied uniformly at the rate of at least 1.5-kg per square meter of surface area.

The finish color of the nonskid surface shall be charcoal gray. Color shall be approved by the Engineer prior to use.

Prior to applying epoxy and grit to galvanized surfaces, the surface to be coated shall be prepared in conformance with the provisions in Section 59-3.02, "Surface Preparation," of the Standard Specifications.

At least 2 weeks prior to placing any nonskid surface, the Contractor shall submit to the Engineer for approval the method of application stating the spread rate of epoxy and grit and the number of coats and a 0.1 square meter test panel placed on 6 mm minimum thickness galvanized steel.

At the option of the Contractor, a test panel of a commercial quality nonskid surface, comprised of a 2-component ultra violet resistant epoxy and grit of quality equal to the above requirements, may be submitted to the Engineer for approval.

MEASUREMENT AND PAYMENT

Bikepath expansion joint will be measured and paid for by the meter of expansion joint actually installed.

The contract price paid per meter of bikepath expansion joint shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and all the work involved in constructing the bikepath expansion joint including nonskid surface, as shown on the plans, as specified in the Standard Specification and these special provisions, and as directed by the Engineer.

If a portion or all of the bikepath expansion joint 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).

10-1.73 STRUCTURE APPROACH SLABS (TYPE N)

This work shall consist of constructing reinforced concrete approach slabs, structure approach drainage system, and treated permeable base at structure approaches in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

GENERAL

Attention is directed to "Engineering Fabrics" of these special provisions.

STRUCTURE APPROACH DRAINAGE SYSTEM

Geocomposite Drain

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.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 complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.

Filter fabric for the geocomposite drain shall conform to the provisions for filter fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

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.

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 non-connecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.

The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.

Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a 150 mm overlap.

Plastic Pipe

Plastic pipe shall conform to the provisions for pipe for edge drains and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.

Drainage Pads

Concrete for use in drainage pads shall be minor concrete, except the concrete shall contain not less than 325 kilograms of cement per cubic meter.

Treated Permeable Base At Bottom Of Geocomposite Drains

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall conform to the provisions in "Treated Permeable Base Under Approach Slab." If asphalt treated permeable base is used, it shall be placed at a temperature of not less than 82°C nor more than 110°C.

The filter fabric to be placed over the treated permeable base at the bottom of geocomposite drains shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications.

ENGINEERING FABRICS

Filter fabric to be placed between the structure approach embankment material and the treated permeable base shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

The subgrade to receive the filter fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified for the material involved.

Filter fabric shall be aligned, handled, and placed in a wrinkle-free manner in conformance with the manufacturer's recommendations.

Adjacent borders of the filter fabric shall be overlapped from 300 to 450 mm or stitched. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When the fabric is joined by stitching, it shall be stitched with yarn of a contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The number of stitches per 25 mm of seam shall be 5 to 7.

Equipment or vehicles shall not be operated or driven directly on the filter fabric.

TREATED PERMEABLE BASE UNDER APPROACH SLAB

Treated permeable base under structure approach slabs shall consist of constructing either an asphalt treated permeable base or a cement treated permeable base in accordance with Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

The type of treatment to be used shall be at the option of the Contractor.

The Contractor shall notify the Engineer in writing, not less than 30 days prior to the start of placing the treated permeable base, which type of treated permeable base will be furnished. Once the Contractor has notified the Engineer of the selection, the type to be furnished shall not be changed without a prior written request to do so and approval thereof in writing by the Engineer.

Asphalt treated permeable base shall be placed at a temperature of not less than 93°C nor more than 121°C. Material stored in excess of 2 hours shall not be used in the work.

Asphalt treated permeable base material may be spread in one layer. The base material shall be compacted with a vibrating shoe type compactor or rolled with a roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Rolling shall begin as soon as the mixture has cooled sufficiently to support the weight of the rolling equipment without undue displacement.

Cement treated permeable base material may be spread in one layer. The base material shall be compacted with either a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Compaction shall begin within one-half hour after the spreading operation and shall consist of 2 complete coverages of the treated material.

APPROACH SLABS

Concrete for use in approach slabs shall contain not less than 400 kilograms of cementitious material per cubic meter.

The steel angle at the concrete barrier joint shall conform to the provision in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Structure approach slabs shall be cured for not less than 5 days prior to opening to public traffic, unless, at the option of the Contractor, the structure approach slabs are constructed using concrete with a nonchloride Type C chemical admixture conforming to these special provisions.

Portland cement for use in concrete using a nonchloride Type C chemical admixture shall be Type II or Type III conforming to the provisions in Section 90-2.01, "Cementitious Materials," of the Standard Specifications. Mortar containing the Type II portland cement to be used and Ottawa sand shall not contract in air more than 0.053 percent when tested in conformance with California Test 527.

The nonchloride Type C chemical admixture, approved by the Engineer, shall conform to the requirements in ASTM Designation: C 494/C 494M and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with nonchloride Type C chemical admixture shall be prequalified prior to placement in conformance with the provisions for prequalification of concrete specified by compressive strength in Section 90-9.01, "General," of the Standard Specifications and the following:

A. Immediately after fabrication of the 5 test cylinders, the cylinders shall be stored in a temperature medium of 21°C ± 1.5°C until the cylinders are tested.
B. The 6-hour average strength of the 5 test cylinders shall not be less than 5.85 MPa. Not more than 2 test cylinders shall have a strength of less than 5.5 MPa.

The top surface of approach slabs shall be finished and treated in conformance with the provisions for decks in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs shall be edger finished.

Approach slabsshall be cured with pigmented curing compound (1) in conformance with the provisions for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Structure approach slabs constructed using concrete with a nonchloride Type C chemical admixture shall be cured for not less than 6 hours prior to opening to public traffic. The curing period shall be considered to begin at the start of discharge of the last truckload of concrete to be used in the slab.

If the ambient temperature is below 18°C during the curing period for approach using concrete with a nonchloride Type C chemical admixture, an insulating layer or blanket shall be used to cover the surface. The insulating layer or blanket shall have an R-value rating given in the table below. At the Contractor's option, a heating tent may be used in lieu of or in combination with the insulating layer or blanket.

Temperature Range During Curing Period	R-value, minimum
13°C to 18°C	1
7°C to 13°C	2
4°C to 7°C	3

JOINTS

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints" of the Standard Specifications. The sealant may be mixed by hand-held, power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held, power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, and drainage pads, treated permeable base, filter fabric, miscellaneous metal, pourable seals, shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab of the type shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.74 SEALING JOINTS

Joints in bikepath ramp and landing, and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.75 INSTALL MODULAR JOINT SEAL ASSEMBLY

This work shall consist of inspection, shipping and installation of State-furnished modular joint seal assembly in Hinge FE in conformance with the details shown on the plans and the requirements of these special provisions.

The Contractor's attention is directed to section "State-Furnished Materials" of these special provisions.

The modular joint seal assembly consists of supporting elements, supports, sealing elements, and anchorage elements.

MANUFACTURER

Modular joint seal assembly is a Maurer Sohne Swivel-Joist Expansion Joint manufactured and supplied by:

THE D.S. BROWN COMPANY
300 E. CHERRY STREET
NORTH BALTIMORE, OHIO 45872
TEL: (419) 257-3561
FAX: (419) 257-2200

WORKING DRAWINGS

The Contractor shall submit working drawings in conformance with the provisions in section "Working Drawings" elsewhere in these special provisions, and these special provisions.

Working drawings shall include the method, materials, equipment, and procedures of installation that the Contractor proposes to use.

Working drawing submittal shall include the following:

1. Installation plans including methods, materials, equipment, sequence, lifting mechanisms and locations, details of temporary anchorage during setting, temperature adjustment devices, opening dimensions relative to temperature, installation details at curbs, seal installation details and other procedures that the Contractor proposes to use for installation of the modular joint seal assembly.
2. Plan for achieving water tightness including details related to performing the water tightness test as specified in these special provisions.
3. Anchorage components including concrete blockout details and any additions or rearrangements of the reinforcing steel from that shown on the plans.
4. Storage plans for interim storage and on-site storage details including temporary support for the modular joint seal assemblies.
5. Plans for transporting and handling the modular joint seal assembly.

A supplement to the working drawings shall include the modular joint seal assembly inspection report as specified in these special provisions.

The working drawings and supplement shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

After complete working drawings and supplement are received by the Engineer, the Contractor shall allow the Engineer 20 working days to review the submittal. No shipping or installation of the modular joint seal assembly shall begin until the Engineer has reviewed and approved the working drawings and supplement submittal.

Upon completion of installation, the Contractor shall submit to the Engineer certification stating that each modular joint seal assembly was installed in accordance with the approved working drawings installation procedure.

STORAGE, TRANSPORATION, AND HANDLING

The modular joint seal assembly is stored at a storage facility within 25 km of the San Francisco-Oakland Bay Bridge Toll Plaza. The Contractor shall notify the Engineer at least two weeks prior to pick-up of the modular joint seal assembly from storage.

Prior to transporting the modular joint seal assembly to the bridge site, the Contractor shall inspect the modular joint seal assembly for damage at the storage location. The Contractor shall furnish to the Engineer a modular joint seal assembly inspection report. The inspection report shall include the condition of the modular joint seal assembly and any existing damages that may have occurred prior to the Contractor's receiving the assembly. If no damage is found, the Contractor shall include a statement in the inspection report to state that the modular joint seal assembly is in good condition and acceptable for delivery and installation.

Lifting mechanisms, temperature adjustment devices, and temporary anchorages shall not be welded to the center beams.

Damage to the modular joint seal assembly during transportation or handling shall be cause for rejection of the modular joint seal assembly.

Damage to the corrosion protection system shall be repaired to the satisfaction of the Engineer prior to installation.

INSTALLATION

No modular joint seal assembly shall be installed until the Engineer has reviewed and approved, in writing, the working drawings and supplement.

A qualified manufacturer's installation technician shall be present at the project site to assure proper installation of each modular joint seal assembly. The qualified installation technician shall inspect the blockout prior to installation and shall be present during lowering of the modular joint seal assembly into the blockout, leveling, adjusting of the cell width and grouting below support boxes. The qualified installation technician shall inspect anchorage reinforcement and the formwork before placing concrete and shall be present during the concrete placement operation. The Contractor shall comply with all recommendations made by the modular joint seal assembly manufacturer's installation technician as approved by the Engineer. The modular joint seal assembly installation technician shall certify to the Engineer that the approved installation procedures were complied with. All certifications to the Engineer shall be in writing and shall be signed and dated by the manufacturer's installation technician.

The modular joint seal assembly shall be installed in accordance with the approved working drawings and supplement and the recommendations of the manufacturer's installation technician.

The installed modular joint seal assembly shall match the finished roadway profile and grades.

The Contractor shall protect the modular joint seal assembly from damage. The Contractor shall protect concrete blockouts and support systems from damage and construction traffic prior to installation of the modular joint seal assembly.

The modular joint seal assembly shall be set to a gap width corresponding to the ambient temperature at the time of setting. The gap widths shall conform to the values shown on the plans and approved working drawings and supplement. The Contractor shall provide hardware for mechanically opening or closing the modular joint seal assembly for thermal adjustments. The manufacturer shall provide factory attached lifting devices and brackets to facilitate field handling and grade adjustments.

The modular joint seal assembly shall be tested for water tightness after installation. The Contractor shall flood the completely installed modular joint seal assembly with water to a minimum depth of 75 millimeters for a duration of at least one hour. If leakage is observed, the modular joint seal assembly shall be repaired to the satisfaction of the Engineer at the Contractor's expense. The repair procedure shall be prepared by the modular joint seal assembly manufacturer and shall be submitted to the Engineer for approval. After repairs are completed, the modular joint seal assembly shall be retested for leakage.

The Contractor shall replace sealing elements not fully bonded to the steel extrusions with fully bonded seals at the expense of the Contractor.

The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Deck," of the Standard Specifications after placing modular joint seal assembly and anchorage.

The assembly shall be completely assembled and placed in a blocked out recess as shown on the plans.

All reinforcement other than primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

The vertical modular joint seal assembly in barrier shall be available for inspection after placement of the recess concrete around the anchorage components of the assembly.

The assembly shall make a watertight, continuous return 150 mm up into the barrier at the low side of the deck joint. Neoprene glands shall be continuous without field splices or joints, including the return up into barrier.

MEASUREMENT AND PAYMENT

Install modular joint seal assembly will be measured by the unit as determined from actual count in the completed work.

The contract unit price paid for install modular joint seal assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing modular joint seal assembly, complete in place, including inspection prior to transporting, storing, transporting, water testing, and inspection and certification by a qualified installation technician of the modular joint seal assembly manufacturer, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.76 OVERHEAD SIGN FOUNDATION

This work shall consist of constructing special pile footing foundation for overhead sign structure as shown on the plans and as specified in these special provisions.

Structure excavation and structure backfill, concrete, and reinforcement for special pile footing foundation shall conform to the provisions in "Earthwork," "Concrete Structures," and "Reinforcement," of these special provisions.

Special pile footing foundation shall be completed at least 7 days before sign structures are erected thereon.

After placing, the exposed surfaces of the special pile footing foundation shall be cured as provided in Section 90-7, "Curing Concrete."

Exposed surfaces of overhead sign foundation shall receive a surface finish conforming to the provisions in Section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications.

Overhead sign foundations will be measured and paid for by the unit.

The contract unit price paid for overhead sign foundation shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing special pile footing foundation, complete in place, including structure excavation and backfill, and furnishing and placing bar reinforcing steel as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Furnishing and driving piling will be measured and paid for as separate items of work.

10-1.77 ROADWAY LIGHT POLE FOUNDATION (BRIDGE)

This work shall consist of constructing roadway light pole foundations (bridge) for roadway light poles and fixtures in conformance with the details and locations as shown on the plans, and as specified in these special provisions.

Concrete and reinforcement for roadway light pole foundations (bridge) shall conform to "Concrete Structures," and "Reinforcement," of these special provisions.

Anchor bolts not designated on the plans as high strength (HS) or stainless steel shall conform to the requirements in ASTM Designation: F 1554, Grade 36. High strength anchor bolts shall conform to the requirements in ASTM Designation: F 1554, Grade 105.

Anchor bolts shall be placed in proper position and to proper height and alignment, and shall be held in place by means of a template.

One double heavy hex nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt. The Contractor shall provide temporary protection, as determined by the Engineer, of exposed bolt threads for each bolt.

All ferrous metal parts shall be galvanized and shall not be painted.

Full compensation for constructing roadway light pole foundations (bridge) including furnishing and installing anchor bolts, leveling nuts, double heavy hex nuts, washers and temporary removable timber template, including temporary protection of anchor bolt threads, 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.

10-1.78 EPOXY GROUT DOWEL

Epoxy grout dowel shall conform to the details shown on the plans, and the requirements in these special provisions.

The work consists of preparing and cleaning concrete surfaces, placing epoxy grout at the locations and inserting dowels shown on the plans or specified in these special provisions.

Epoxy grout shall consist of a mixture of epoxy binder and aggregate. The epoxy binder shall conform to the provisions in Sections 95-1, "General," and 95-2.10, "Binder (Adhesive) Epoxy Resin Base, Fast Setting Low Viscosity," of the Standard Specifications, and to the requirements in this section.

Aggregate shall conform to the requirements for aggregate for portland cement concrete in Section 90, "Portland Cement Concrete," of the Standard Specifications. The amount of moisture in the aggregate when mixed with binder shall not exceed 0.50-percent, as determined by California Test 226.

Aggregate gradation shall conform to the provisions in Section 90-3.03, "Fine Aggregate Grading," of the Standard Specifications.

The minimum temperature of the epoxy grout after mixing shall be 10°C, except that when the ambient temperature is below 10°C, the minimum temperature of the concrete or grout shall be 18°C.

The temperature of the aggregate at the time of mixing shall not be more than 32°C.

The mix proportions of epoxy grout shall be one part of binder to approximately 4 parts of aggregate, by volume.

The aggregate shall be stored and proportioned so as to give a uniformly combined material. The aggregate and the epoxy binder shall be mixed in equipment and by methods that result in a homogeneous mixture.

In addition to the provisions in Sections 95-1.03, "Packaging, Labeling and Storing," and 95-1.04, "Directions for Use," of the Standard Specifications, the following shall apply:

The components may be delivered in containers larger than 20 L in volume provided the containers have removable type lids with seals that prevent leakage. Containers previously opened and containing unused materials shall be resealed and stored in a protected environment to prevent the intrusion of water or other contaminants. The labels on the containers shall be kept intact and clean to permit positive identification of the contents.

The components may be delivered in the tanks of 2-component metering, mixing, and application equipment having removable type lids with seals when the equipment has previously been approved for use.

Immediately before withdrawing material from the container or application by the 2-component equipment, each component shall be thoroughly mixed in the container or tank by power driven paddles or devices.

Each container shall be labeled as required in Section 95-1.03. Each delivery of material in the tanks of 2-component equipment shall be accompanied by a ticket containing all the label data listed in Section 95-1.03.

Prior to placing epoxy grout, the holes to be filled shall be free of all dust, loose particles and deleterious materials by pressure jetting with air or by other suitable means.

Epoxy grout dowel will be measured and paid for by the meter measured by the number and depth of the grout holes as shown on the plans, or as directed by the Engineer.

The contract price paid per meter for epoxy grout dowel shall include full compensation for furnishing all labor, materials (except the reinforcing steel dowels), tools, equipment, and incidentals, and for doing all the work involved in cleaning the grout holes, placing epoxy grout, and inserting 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.

10-1.79 POLYESTER CONCRETE OVERLAY (20 mm, 12 mm)

GENERAL

Summary

This work includes placing a polyester concrete overlay with a high molecular weight methacrylate (HMWM) resin prime coat to bridge decks, at the following locations, as shown on the plans, and as specified in these special provisions:

1. Skyway Structures: westbound and eastbound, adjacent to Hinges EW and EE
2. Skyway Structures: gaps between the new concrete barriers and existing polyester concrete overlay, at westbound structure between Sta W 82+67.00 and W 82+95.00, and at eastbound structure between Sta E 82+38.61 and E 82+66.31.
3. Bikepath structure, and bikepath ramp and landing

Polyester concrete overlay (12 mm) for the bikepath structure including the bike path ramp and landing area shall be colored as shown on the plans. Referee samples of Federal Color No. 26099, "Charcoal Gray" and Federal Color No. 26440, "Light Gray" are available in conformance with the provisions in "Supplemental Project Information" of these special provisions.

Submittals

Submit an overlay placement plan in conformance with the provisions in "Working Drawings," of these special provisions. The plan review time will be 15 days.

The overlay placement plan must include:

1. Schedule of overlay work and testing for each bridge
2. Description of equipment for applying HMWM resin
3. Description of equipment for measuring, mixing, placing, and finishing polyester concrete overlay
4. Method for isolating expansion joints
5. Cure time for polyester concrete
6. Description of equipment for applying sand
7. Storage and handling of HMWM resin and polyester concrete components
8. Disposal of excess HMWM resin, polyester concrete, and containers

Submit a material safety data sheet for each shipment of HMWM and polyester resin components before use.

Quality Control and Assurance

Submit samples of HMWM and polyester resins 15 days before use under Section 6-3, "Testing," of the Standard Specifications. Notify the Engineer 15 days before delivery of resin in containers over 209 liters to the job site.

Complete the following trial overlays before starting work:

1. A trial overlay is required for polyester concrete overlay (20 mm).
2. A trial overlay is required for each color of polyester concrete overlay (12 mm)

Results from airborne emissions monitoring of the trial overlays must be submitted to the Engineer before starting production work.

The trial overlay approved by the Engineer shall be used as the standard of determining acceptability of color and appearance for the polyester concrete surfaces.

The trial overlay site shall be within 10 km of the project site and will be determined by the Engineer.

The trial overlay must:

1. Be at least 3.6 meters wide by 1.8 meters long and the same thickness as the project overlay
2. Be constructed on a prepared concrete base
3. Be placed within the project limits at an approved location
4. Be constructed using the same equipment as the production work
5. Replicate field conditions for the production work
6. Determine the initial polyester concrete set time
7. Demonstrate suitability of the proposed means and methods
8. Demonstrate suitability of the airborne emissions monitoring plan
9. Be disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications

MATERIALS

Polyester concrete consists of polyester resin binder and aggregate.
Polyester resin binder must:

1. Be an unsaturated isophthalic polyester-styrene co-polymer.
2. Contain at least 1 percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
3. Be used with a promoter compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
4. Comply with the following:

Polyester Resin Binder

Property	Requirement	Test Method
Viscosity *	0.075 to 0.200 Pa·s (RVT, No. 1 Spindle, 20 RPM at 77°F)	ASTM D 2196
Specific Gravity *	1.05 to 1.10 at 25°C	ASTM D 1475
Elongation	35 percent, minimum Type I at 11.5 mm/min. Thickness = 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
Tensile Strength	17.5 MPa, minimum Type I at 11.5 mm/min. Thickness = 6.5±1 mm	ASTM D 638
	Sample Conditioning: 18/25/50 + 5/70	ASTM D 618
Styrene Content *	40 percent to 50 percent by weight	ASTM D 2369
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum, at 24 hours and 21° ± 1°C	California Test 551
Static Volatile Emission *	60 gram per square meter, loss, maximum	SCAQMD Method 309-91

*Test must be performed before adding initiator.

Aggregate for polyester concrete must:

1. Comply with Section 90-2.02, "Aggregates," of the Standard Specifications
2. Have at most 45 percent crushed particles retained on the 2.36-mm sieve when tested under California Test 205
3. Have fine aggregate consisting of natural sand
4. Have a weighted average aggregate absorption of at most 1 percent when tested under California Tests 206 and 207
5. At the time of mixing with resin, have a moisture content of at most one half of the weighted average aggregate absorption when tested under California Test 226
6. Comply with one of the following aggregate gradings:

Combined Aggregate Grading

Sieve Size	Percentage Passing	
	3/8 inch Maximum	No. 4 Maximum
12.5-mm	100	100
9.5-mm	83 - 100	100
4.75-mm	65 - 82	62 - 85
2.36-mm	45 - 64	45 - 67
1.18-mm	27 - 48	29 - 50
600-µm	12 - 30	16 - 36
300-µm	6 - 17	5 - 20
150-µm	0 - 7	0 - 7
75-µm	0 - 3	0 - 3

HMWM resin prime coat consists of a resin, promoter, and initiator. HMWM resin must:

1. Be low odor and wax-free
2. Comply with the following:

Methacrylate Resin

Property	Requirement	Test Method
Volatile Content *	30 percent, maximum	ASTM D 2369
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
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21 ± 1°C	California Test 551

* Test must be performed before adding initiator.

Sand for abrasive sand finish must:

1. Be commercial quality blast sand
2. Have at least 95 percent pass the 2.36-mm sieve and at least 95 percent retained on the 0.85-mm sieve when tested under California Test 205
3. Have an average absorption of at most 1 percent when tested under California Test 207

CONSTRUCTION

Use a continuous mixer to mix polyester concrete. The continuous mixer must:

1. Employ an auger screw/chute device.
2. Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every 5 minutes, including time and date. Submit recorded volumes at the end of the work shift.
3. Have a visible readout gage that displays volumes of aggregate and resin being recorded.
4. Be certified under California Test 109 before use.
5. Produce a satisfactory mix consistently during a demonstration.

Polyester concrete may be mixed in mechanical mixers of at most 0.25-cubic meter capacity.

Finishing equpiment for polyester concrete must:

1. Have grade control capabilities
2. Be used to consolidate the polyester concrete

The Engineer will provide final grade and cross slope before the start of overlay work.

Attention is directed to "Concrete Structures" of these special provisions regarding temporary bridging at existing hinges for deck smoothness testing and grinding of existing deck surfaces.

Prepare the deck under "Prepare Concrete Bridge Deck Surface," of these special provisions.

Expansion joints shall be adequately isolated before overlaying, as approved by the Engineer.

The deck must be dry before placing the HMWM prime coat. The concrete surface must be at least 10 degrees C and at most 38 degrees C. Relative humidity must be at most 85 percent.

Sweep the deck. Blow the deck clean with compressed air.

Thoroughly mix all components of HMWM resin prime coat. Apply the HMWM resin to the deck surface:

1. Within 5 minutes of mixing
2. At a rate of approximately 2.2 square meters per liter
3. Uniformly and spread to completely cover surfaces to be overlaid

Place the HMWM prime coat on magnesium phosphate concrete no sooner than 72 hours after final set or on modified high alumina based concrete no sooner than 30 minutes after final set.

Initiate the polyester resin binder and blend completely. Add aggregate and mix for at least 2 minutes.

Place the polyester concrete:

1. Immediately after applying the HMWM prime coat
2. Before gelling
3. Within 15 minutes of adding initiator

The resin binder must weigh approximately 12 percent of the weight of the aggregate. The Engineer will determine the exact percentage. Polyester concrete must have an initial set time of at least 30 minutes and at most 120 minutes when tested using an initial-setting time Gillmore needle under ASTM C 266.

Consolidate and finish the overlay to the required grade and cross section using finishing equipment. Polyester concrete must be consolidated to a relative compaction of at least 97 percent when tested under California Test 552.

Apply a sand finish of at least 0.4-kg per square meter before gelling occurs.

Protect the overlay from moisture for at least 4 hours after finishing. Allow traffic or equipment on the overlay no sooner than 4 hours after final finishing.

Completed polyester concrete deck surfaces must comply with Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications and these special provisions.

The texture of polyester concrete overlay surfaces for the polyester concrete overlay (20 mm) shall be uniform and shall have a coefficient of friction of not less than 0.35 as measured by California Test 342. Portions of surfaces that do not meet the above requirements shall be ground or grooved parallel to the centerline in conformance with the provisions of Section 42, "Groove and Grind Pavement," of the Standard Specifications until the above criteria is met.

Grooves shall be made after the concrete has received the specified abrasive sand finish and shall be within 150 mm from the layout line for the toe of the concrete barrier. Grooving shall be done in such a manner as to prevent the texture device from tearing the surface or causing the visible separation of coarse aggregate at the surface. Grooving of the polyester concrete surface shall conform to one of the following methods:

A. Grooving operations shall conform to the requirements in Section 42-1, "Grooving," of the Standard Specifications.
B. Grooves shall be made with spring steel tines. Spring steel tines of the final texturing device shall be rectangular in cross section, 2 mm to 4 mm wide, on 19 mm to 24 mm centers, and of sufficient length, thickness and resilience to form grooves approximately 5 mm deep in the fresh polyester concrete surface. Final texture shall be uniform in appearance and longitudinal grooves shall have a depth between 2 mm and 8 mm.

The texture of polyester concrete overlay surfaces for the polyester concrete overlay (12 mm) shall be broomed transversely to the line of traffic. At the option of the Contractor, clean dry sand may be thrown on the surface and used to aid in the broomed surface texturing.

Taper polyester concrete overlay edges if the overlay is not completed within the allowable lane closure time and is more than 12 mm higher in elevation than the adjacent pavement. Taper edges transverse to the direction of traffic at a 20:1 (horizontal:vertical) slope. Taper edges longitudinal to the direction of traffic at a 4:1 (horizontal:vertical) slope. Tapers may remain and be overlaid with polyester concrete overlay.

MEASUREMENT AND PAYMENT

Furnishing polyester concrete overlay of the thicknesses listed in the Engineer's Estimate will be measured and paid for by the cubic meter. The volume to be paid for will be determined based on the quantity of resin binder used, the percent by weight of resin binder in the polyester concrete, and a unit weight of 2160 kg per cubic meter. The payment quantity shall be the calculated quantity of polyester concrete overlay used in the work, except material used in trial overlays and wasted or unused material. When the plans show that unsound concrete patching material is polyester overlay, the payment quantity will include the patches.

Place polyester concrete overlay of the thicknesses listed in the Engineer's Estimate will be measured and paid for by the square meter. The area to be paid for will be based on the plan dimensions.

The contract price paid per cubic meter for furnish polyester concrete overlay of the thicknesses 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 polyester concrete, including furnishing HMWM resin prime coat and materials for trial overlays, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

The contract price paid per square meter for place polyester concrete overlay shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the polyester concrete overlay, complete in place, including application of HMWM prime coat and constructing and disposing of trial overlays and base, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

Full compensation for furnishing and mixing color shall be considered as included in the contract price paid per cubic meter for furnish polyester concrete overlay (12 mm) and no additional compensation will be allowed therefor.

Full compensation for grooving the polyester concrete surface shall be considered as included in the contract price paid per square meter for place polyester concrete overlay (20mm) and no separate payment will be made therefor.

Full compensation for furnishing and placing polyester concrete overlay (20 mm) at gaps between the new concrete barriers and existing polyester concrete overlay, at westbound and eastbound structures shall be considered as included in the contract price paid per square meter for place concrete polyester overlay (20 mm) and no additional compensation will be allowed therefor.

Modifications to existing bridge deck smoothness will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.80 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture for concrete surfaces at Abutment E23R, and precast concrete wall (Type 1) 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 texture listed below is required at concrete surfaces shown on the plans:

Fractured rib texture

The fractured rib texture shall be an architectural texture simulating the appearance of straight ribs of concrete with a fractured concrete texture imparted to the raised surface between the ribs. Grooves between ribs shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6 mm for each 3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining ribs and groups of ribs shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

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.

A separate test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing precast concrete wall (Type 1). 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 panels approved by the Engineer shall be used as the standards of comparison in determining acceptability of architectural texture for concrete surfaces and precast concrete wall (Type 1) panels.

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 at abutment E23R 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 and additional test panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for architectural texture on precast concrete wall (Type 1), including test panels and additional test panels, shall be considered as included in the contract price paid per square meter for precast concrete wall (Type 1) and no separate payment will be made therefor.

10-1.81 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Where ASTM Designations: A706/A706M reinforcing bars are specified on the plans or in these special provisions, the minimum percentage of elongation in 200 mm for Bar Nos. 43 and 57 on Table 2 of ASTM A706/706M Specifications shall be 12%.

The Department's Pre-Qualified Products List for mechanical splices can be found at:

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

The provisions in "Welding Quality Control" of these special provisions do not apply to resistance butt welding.

EPOXY-COATED PREFABRICATED REINFORCEMENT

Bar reinforcement to be epoxy coated shall conform to the ASTM designation and grade required or permitted by Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications for the location or type of structure involved. The coated bar reinforcement shall conform to the requirements in ASTM Designation: A 934/A 934M except as provided herein.

Wire reinforcement to be epoxy coated shall conform to the ASTM designation and grade required or permitted by Section 52-1.02D, "Reinforcing Wire," of the Standard Specificationsfor the location or type of structure involved. The coated wire reinforcement shall conform to the requirements for Class A, Type 2 coating of ASTM Designation: A 884/A 884M except as provided herein.

Appendices X1 and X2, "Guidelines For Job-Site Practices," of ASTM Designation: A 884/A 884M and A 934/A 934M, respectively, applies except as provided herein. The term "shall" replaces the term "should" in these appendices. Section X1.2 of Appendix X1 and Section X2.2 of Appendix X2 do not apply.

All coatings shall be purple or gray in color.

The epoxy powder coating shall be selected from the Department's Pre-Qualified Products List.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for each shipment of epoxy-coated bar or wire reinforcement certifying that the coated bars or wire conform to the requirements in ASTM Designation: A 934/A 934M for bars or Designation: A 884/A 884M for wire and the provisions in these special provisions. This Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 934/A 934M for bars or ASTM Designation: A 884/A 884M for wire. All qualification testing and certification shall be by an independent laboratory.

Except for field welding of butt splices, all welding of reinforcement shall be complete before epoxy coating the reinforcement.

Before epoxy coating, all resistance butt welds shall have the weld flash removed to produce a smooth profile free of any sharp edges that would prevent proper coating of the bar. The flash shall be removed such that the ultimate tensile strength and elongation properties of the bar are not reduced and the outside radius of the flash at any point along the circumference of the bar is (1) not less than the nominal radius of the bar nor (2) greater than 5 mm beyond the nominal radius of the bar.

A proposed weld flash removal process shall be submitted to and approved by the Engineer in writing before performing any removal work. The submittal shall demonstrate that the proposed flash removal process produces a smooth profile that can be successfully epoxy coated in conformance with the requirements specified herein.

Bending of epoxy-coated reinforcement after the coating has been applied will not be allowed.

When any portion of a reinforcing bar or wire requires epoxy coating, the entire bar or wire shall be coated except when the bar or wire is spliced outside of the limits of epoxy coating shown on the plans, epoxy coating will not be required on the portion of bar or wire beyond the splice.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic coated or epoxy coated to prevent corrosion of the devices or damage to the coated reinforcement.

Prior to coating, the Contractor shall furnish to the Transportation Laboratory a representative 110 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.

Two 700-mm-long samples of coated bar or wire reinforcement from each size and from each load shipped to the job site shall be furnished to the Engineer for testing. These samples shall be representative of the material furnished. These samples, as well as any additional random samples taken by the Engineer, may be tested for specification compliance. Additional sampling and all tests performed by the Engineer may be performed at any location deemed appropriate by the Engineer. Failure of any sample to meet the requirements of the specifications will be cause for rejection.

If any bar tested for coating thickness or for adhesion of coating fails to meet the requirements for coated bars in Section 9 of ASTM Designation: A 934/A 934M, 2 retests on random samples taken from bars represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated bars represented by the samples may be certified as meeting the test requirements.

If any wire reinforcement tested for coating thickness or for flexibility fails to meet the requirements for coated wire in Section 8 of ASTM Designation: A 884/A 884M, 2 retests on random samples taken from wire represented by the failed test will be conducted for each failed test. If the results of both retests meet the specified requirements, the coated wire represented by the samples may be certified as meeting the test requirements.

Epoxy-coated reinforcement shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the reinforcement from exposure to sunlight, salt spray, and weather. For stacked bundles, 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 reinforcement to prevent condensation under the covering. Epoxy-coated reinforcement shall not be stored within 300 m of ocean or tidal water for more than 2 months.

All visible damage to coatings caused by shipping, handling, or installation shall be repaired as required for repairing coating damaged before shipment conforming to the requirements in ASTM Designation: A 934/A 934M for bar reinforcement or ASTM Designation: A 884/A 884M for wire reinforcement. When the extent of coating damage prior to repair exceeds 2 percent of the bar or wire surface area in any 300 mm length, repair of the bar or wire will not be allowed and the coated bar or wire will be rejected.

The patching material and process shall be suitable for field application. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as a material compatible with the reinforcement coating or shall be accompanied by a Certificate of Compliance certifying that the material is compatible with the reinforcement coating. Damaged areas shall be patched in conformance with the patching material manufacturer's recommendations.

Except for lap splices, all splices for epoxy-coated reinforcement shall be coated with a corrosion protection covering that is selected from the Department's Pre-Qualified Products List. The covering shall be installed in conformance with the manufacturer's recommendations.

Any portion of bar or wire reinforcement extending beyond the limits for epoxy-coated reinforcement shown on the plans will be measured and paid for as bar reinforcing steel (bridge).

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.

The contract price paid per kilogram for bar reinforcing steel (barrier slab) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing bar reinforcing steel in barrier slab, regardless of type, 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 HEADED BAR REINFORCEMENT

GENERAL

Headed bar reinforcement shall consist of bar reinforcement with heads attached to one or both ends and shall conform to the provisions of Section 52, "Reinforcement," of the Standard Specifications, the details shown on the plans, and these special provisions. The type of headed bar reinforcement to be used on this project shall be selected from the Department's Pre-Qualified Products List at:

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

The provisions of "Welding Quality Control" of these special provisions shall not apply to headed bar reinforcement.

The Contractor shall perform inspection and testing before, during, and after manufacturing headed bar reinforcement and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

A daily production log for the manufacture of headed bar reinforcement shall be maintained by the manufacturer for each production lot. The log shall clearly indicate the production lot numbers, the heats of bar material and head material used in the manufacture of each production lot, the number of bars in each production lot, and manufacturing records, including tracking and production parameters for welds or forgings. The data from the daily production log shall be available to the Engineer on request.

A production lot of headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with heads of the same size and type, and manufactured by the same method, produced from bar material of a single heat number and head material of a single heat number. If one reinforcing bar has a head on both ends, it will be counted as 2 reinforcing bars for the purposes of establishing and testing production lots. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 units is reached.

The Contractor shall furnish Certificates of Compliance accompanied by a copy of the mill test report, the Production Tests Reports specified herein, and the corresponding daily production logs to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each shipment of headed bar reinforcement delivered to the jobsite.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

Equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the reinforcement. The parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, and forge upset distance and time. The data from this monitoring shall be recorded and preserved by the manufacturer until acceptance of the contract and shall be provided to the Engineer upon request.

PRODUCTION TESTS

Production tests shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The independent qualified testing laboratory used to perform the testing of headed bar reinforcement samples 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:

1. A tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
2. Operators who have received formal training for performing the testing requirements of ASTM A 970/A 970M.
3. 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 Engineer shall be notified in writing when any lots of headed bar reinforcement are ready for testing. The notification shall include the number of lots to be tested and the location where the tests are to be conducted. After notification has been received, test samples will be randomly selected by the Engineer from each production lot of headed bar reinforcement that is ready for shipment to the jobsite. If epoxy coating is required, test samples will be taken after the headed bar reinforcement has been prepared for epoxy coating.

A minimum of 3 samples from each production lot shall be tested. One tensile test shall be conducted on each sample.

Tensile tests shall conform to the requirements specified in ASTM A 970/A 970M, Section 6, Class A, except that at rupture, there shall be visible signs of necking in the reinforcing bar 1) at a minimum distance of one bar diameter away from the head to bar connection for friction welded headed bar reinforcement, or 2) outside the affected zone for integrally forged headed bar reinforcement.

The affected zone for integrally forged headed bar reinforcement is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered during the manufacturing process.

If one of the test specimens fails to meet the specified requirements, one retest shall be performed on one additional sample, selected by the Engineer, from the same production lot. If the additional test specimen, or if more than one of the original test specimens fail to meet these requirements, all headed bar reinforcement in the lot represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory and submitted to the Engineer as specified herein. 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 the following information for each set of samples: contract number, bridge number, lot number, bar size, type of headed bar reinforcement, physical condition of test sample, any notable defects, limits of affected zone, location of visible necking area, and the ultimate strength of each headed bar.

Each unit of headed bar reinforcement in a production lot to be shipped to the site shall be tagged in a manner such that production lots can be accurately identified at the jobsite. All unidentified headed bar reinforcement received at the jobsite will be rejected.

MEASUREMENT AND PAYMENT

Quantities of headed bar reinforcement will be measured as units determined from the number of heads shown on the plans or as directed by the Engineer.

The contract unit price paid for headed bar reinforcement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing headed bar reinforcement, and conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of headed bar reinforcement, and placing the completed headed bar reinforcement into the work will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated mass of bar reinforcement shall be the entire length of the completed headed bar, including heads.

10-1.83 BRIDGE DECK METHACRYLATE RESIN TREATMENT

GENERAL

Summary

This work includes applying a high molecular weight methacrylate (HMWM) resin system with sand and absorbent material to bridge decks.

Submittals

Submit a HMWM resin system placement plan in conformance with the provisions in "Working Drawings" of these special provisions. The plan review time is 15 days.

The HMWM resin system placement plan must include:

1. Schedule of work and testing for each bridge
2. Description of equipment for applying HMWM resin
3. Range of gel time and final cure time for HMWM resin
4. Absorbent material to be used
5. Description of equipment for applying and removing excess sand and absorbent material
6. Procedure for removing HMWM resin from the deck, including equipment
7. Storage and handling of HMWM resin components and absorbent material
8. Disposal of excess HMWM resin and containers

Submit a material safety data sheet for each HMWM resin system component and diatomaceous earth shipment before use.

Quality Control and Assurance

Submit samples of HMWM resin components 15 days before use under Section 6-3, "Testing," of the Standard Specifications. Notify the Engineer 15 days before delivery of HMWM resin components in containers over 55 gallons to the job site.

Complete a test area before starting work. Results from airborne emissions monitoring of the test area must be submitted to the Engineer before starting production work.

The test area must:

1. Be approximately 50 square meters
2. Be placed within the project limits outside the traveled way at an approved location
3. Be constructed using the same equipment as the production work
4. Replicate field conditions for the production work
5. Demonstrate proposed means and methods meet the acceptance criteria
6. Demonstrate production work will be completed within the time allowed
7. Demonstrate suitability of the airborne emissions monitoring plan

The test area will be acceptable if:

1. The treated deck surface is tack free and non-oily
2. The sand cover adheres and resists brushing by hand
3. Excess sand and absorbent material has been removed
4. The coefficient of friction is at least 0.35 when tested under California Test 342

MATERIALS

HMWM resin system consists of a resin, promoter, and initiator. HMWM resin must be low odor and comply with the following:

HMWM Resin

Property	Requirement	Test Method
Volatile Content*	30 percent, maximum	ASTM D 2369
Viscosity*	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	Specimens prepared per California Test 551
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21 ± 1°C	California Test 551

* Test must be performed before adding initiator.

Sand for abrasive sand finish must:

1. Be commercial quality dry blast sand
2. Have at least 95 percent pass the 2.36-mm sieve and at least 95 percent retained on the 850-µm sieve when tested under California Test 205

Absorbent material must be diatomaceous earth, abrasive blast dust, or substitute recommended by the HMWM resin supplier and approved by the Engineer.

CONSTRUCTION

HMWM resin system applied by machine must be:

1. Combined in volumetric streams of promoted resin to initiated resin by static in-line mixers
2. Applied without atomization

HMWM resin system may be applied manually. Limit the quantity of resin mixed for manual application to 20 L at a time.

Prepare the deck under "Clean Bridge Deck," of these special provisions.

The deck must be dry before applying HMWM resin. The concrete surface must be at least 10 degrees C and at most 38 degrees C. Relative humidity must be expected to be at most 85 percent during the work shift.

Thoroughly mix all components of HMWM resin. Apply HMWM resin to the deck surface within 5 minutes of mixing at approximately 2.2 square meters per liter. The Engineer determines the exact application rate. The resin gel time must be between 40 and 90 minutes. HMWM resin that thickens during application is rejected.

Spread the HMWM resin uniformly. Completely cover surfaces to be treated and fill all cracks. Redistribute excess resin using squeegees or brooms within 10 minutes of application. For textured or grooved deck surfaces, excess resin must be removed from the texture indentations.

Apply the abrasive sand finish of at least one kilogram per square meter or until saturation as determined by the Engineer no sooner than 20 minutes after applying resin. Apply absorbent material before opening lane to traffic. Remove excess sand and absorbent material by vacuuming or power sweeping.

Traffic or equipment will be allowed on the overlay after the Engineer has determined:

1. The treated deck surface is tack free and non-oily
2. The sand cover adheres and resists brushing by hand
3. Excess sand and absorbent material has been removed
4. No material will be tracked beyond limits of treatment by traffic

Remove the HMWM resin from the deck surface if the Engineer determines (1) the above listed conditions have not been met and (2) the allowable lane closure time will be exceeded.

The Engineer performs California Test 342 on treated deck surfaces. The Engineer provides at least a 15-day notice for the Contractor to provide traffic control for each bridge location. The coefficient of friction of the treated deck must be at least 0.35.

MEASUREMENT AND PAYMENT

Bridge deck methacrylate resin treatment will be measured by the square meter based on the dimensions shown on the plans and will be paid for as treat bridge deck. Furnish bridge deck treatment material will be measured by the liter of mixed HMWM resin actually placed and will be paid for as furnish bridge deck treatment material. No payment will be made for materials wasted or not incorporated in the work.

The contract price paid per square meter for treat bridge deck shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and applying bridge deck HMWM resin treatment, including sand and absorbent material, 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 liter for furnish bridge deck treatment material shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary to furnish the bridge deck treatment material to the site of the work ready for application, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.84 SERVICE PLATFORM

Service platform shall consist of furnishing, fabricating, finishing and erecting service platforms and all work required to complete the service platform as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Service platforms shall include the following:

1. Structural steel
3. Reinforced concrete
4. Checkered plates for floor access opening
5. Stairway
6. Metal decking
7. Railings
8. Cleaning and painting metal surfaces.
9. All anchors, fastenings, hardware, accessories and other supplementary appurtenances necessary to complete the work.

All metal surfaces of components for service platforms, except stainless steel components, shall be hot-dip galvanized after fabrication in accordance with Section 75-1.05, "Galvanizing," of the Standard Specifications, unless otherwise noted. The minimum weight of galvanized coating shall be 460 grams per square meter of surface area, except grates shall have a minimum of 610 grams per square meter of surface area.

Except for the locations listed below, all permanently exposed galvanized metal surfaces shall be cleaned and painted in conformance with the provisions for painting galvanized surfaces in "Clean and Paint Structural Steel" of these special provisions:

A. Steel decking
B. Lower framing sections including hangers and kicker
C. Stairway tread
D. Checkered plates for floor access openings

Structural steel shall conform to the provisions in "Steel Structures" of these special provisions. Headed studs shall conform to the requirements for stud connectors in Section 55, "Steel Structures," of the Standard Specifications.

Reinforced concrete for service platforms shall conform to the provisions in "Concrete Structures" of these special provisions and the provisions specified herein.

Shotcrete shall not be used.

Checkered plates for floor access openings shall be of commercial quality steel with standard raised pattern.

Grating for stairway shall conform to Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications.

Unless otherwise specified, all anchors, fastenings, hardware, accessories and other appurtenances necessary to complete the work shall conform to the provisions in "Miscellaneous Bridge Metal" of these special provisions.

WORKING DRAWINGS

The Contractor shall submit working drawings in conformance with the provisions in "Working Drawings" of these special provisions, and these special provisions, except that the time allowed for the Engineer's shall be 20 working days.

Working drawing submittals shall include the following:

A. Fabrication plans including all details, elevations, and sections of the service platforms as shown on the plans. All dimensions and design tolerances shall be specified.
B. All ASTM or other material designations.
C. Detailed working drawings for metal decking showing the grade of steel, the physical and section properties for all deck members, the method of support and grade adjustment, accommodation for skew, and methods of sealing against grout leaks.
D. Service platforms installation plans including methods, materials, equipment, sequence, lifting mechanisms and locations.
E. Manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications.

No fabrication of the service platforms shall begin until complete working drawings are reviewed and approved, in writing, by the Engineer.

METAL DECKING

Steel decking shall be installed in conformance with the approved working drawings.

Welding shall conform to AWS D1.3/D1.3M-08 and "Welding Quality Control" elsewhere in these special provisions.

Welds shall be cleaned immediately by wire brushing, and shall be coated with galvanizing repair material before being covered by the succeeding sheet.

Transverse deck construction joints will not be allowed.

Permanently exposed galvanized surfaces that are abraded or damaged prior to installation shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," of the Standard Specifications. Aerosol cans shall not be used. Minor heat discoloration in area of welds need not be repaired.

RAILING

Railing shall conform to the provisions in Section 83-1.02G(2), "Metal Railing (Tubular)," of the Standard Specifications and these special provisions.

Railing grill shall conform to the provisions in Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications.

Ends of railing pipe for stairway shall be closed, except for a 3 mm diameter weep hole at the low point.

All corners on railings shall be rounded. Simple and compound curves shall be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors shall be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices shall be furnished for connecting railings and handrails to concrete or masonry.

After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done by methods approved by the Engineer. Kinks, twists or bends in the railing may be cause for rejection of the railing.

Railings shall be preassembled in shop to the greatest extent possible to minimize field welding and assembly. Units shall be disassembled only as necessary for shipping and handling limitations. All units shall be clearly match marked for reassembly and installation.

MEASUREMENT AND PAYMENT

Service platforms will be measured by the unit from actual count, regardless of size.

The contract unit price paid for service platform shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing service platforms, complete in place, including reinforced concrete, structural steel, metal decking, railings, stairways, checkered plates, galvanizing, cleaning and painting, and miscellaneous metal items, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.85 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

GENERAL

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

MATERIALS

High-strength fastener assemblies and other bolts attached to structural steel with nuts and washers shall be zinc coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc coated by the mechanical deposition process.

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.

Rotational capacity testing will not be required for embedded high strength bolts used in service platforms.

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: F 436.
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

(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.
(b) Applicable only to connections in which all material within grip of the bolt is steel.
(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.

6. 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, where T = [(the measured tension in pounds) x (the bolt diameter in inches) / 48in/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

7. 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.
8. 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: F 436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6mm 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-lb)
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

5. 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.

6. 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.

7. 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

8. 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.

Neither installation tension tests nor rotational capacity tests will be required for embedded high strength bolts used in service platforms.

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 job site,
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: F 959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SURFACE PREPARATION

For all bolted connections, the contact surfaces and inside surfaces of bolt holes shall be cleaned and coated before assembly in conformance with the provisions for cleaning and painting structural steel of these special provisions.

SEALING

The perimeter around all direct tension indicator gaps 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 have a minimum thickness of 1.3mm. If painting is required, the sealing compound shall be applied prior to painting.

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

Table 2.2 of AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, mm	Minimum Effective Partial Joint Penetration Groove Weld Size*, mm
Over 6 to 13 inclusive	5
Over 13 to 19 inclusive	6
Over 19 to 38 inclusive	8
Over 38 to 57 inclusive	10
Over 57 to 150 inclusive	13
Over 150	16

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

Dimensional details and workmanship for welded joints in tubular and pipe connections shall conform to the provisions in Part A, "Common Requirements of Nontubular and Tubular Connections," and Part D, "Specific Requirements for Tubular Connections," in Section 2 of AWS D1.1.

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.

10-1.86 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", and "Overhead Sign Foundation," 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 "Working Drawings," of these special provisions. 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.

10-1.87 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPA Use Category System: UC4A, Commodity Specification A or B.

10-1.88 INSTALL SIGN PANEL ON EXISTING FRAME

Sign panels shall be installed on existing frames 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 frames 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 frame 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 frames, 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.

10-1.89 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 palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 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/m^2 and 377 mg/m^2, and an average mass of 269 mg/m^2. 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.

FORMED PANEL SIGN

Formed panel signs shall be fabricated from one continuous sheet aluminum alloy 5052-H32 of 1.6-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The aluminum frame shall be affixed to the panel with aluminum rivets through the face of the sign panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed.

The face of finished formed panel sign shall be flat with a tolerance of 10 mm per meter when measured across the plane of each panel in all directions.

The Contractor shall furnish mounting hardware for roadside and overhead formed panel signs. Hardware for the overhead formed panel signs shall include bolts, nuts, and washers.

The length and depth of the overhead formed panel signs shall be within ±2 mm of the detailed dimension.

The formed edges of the overhead panel signs shall be square. The mounting holes shall be straight and perpendicular to the front and back surfaces of the formed edges at the spacing shown on the plans. Holes that are improperly spaced and placed at the wrong angle will be rejected.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of the sign panel types installed in place.

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.

10-1.90 DIRECTIONAL SIGN

GENERAL

Summary

This work includes furnishing and installing directional signs as shown on the plans, as specified in Section 56-2, "Roadside Signs," of the Standard Specifications, and these special provisions.

Directional signs shall consist of galvanized steel posts and frames.

The finish coat for directional sign steel posts and frames shall conform to the provisions in "Clean and Paint Structural Steel," of these special provisions.

The 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: D 1640. The finish coat color shall be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat shall be not less than 125 μm.

MEASUREMENT AND PAYMENT

The quantity of directional sign will be measured as unit determined from actual count.

The contract unit price paid for directional sign shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in furnishing and installing directional sign, complete in place, including galvanized and painted steel posts and frames, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.91 CLEAN AND PAINT PTFE BEARINGS

PTFE Bearings shall be cleaned and painted with a single coat of inorganic zinc in conformance with the provisions in Sections 59-2, "Painting Structural Steel," 59-3, "Painting Galvanized Surfaces," and 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings" of these special provisions, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting 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 paint application.
E. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
F. Proposed methods to protect the coating during curing, shipping, handling, and storage.
G. A detailed paint repair plan for the repair of damaged areas.
H. Proof of SSPC-QP 3 certification. Certification of AISC Sophisticated Paint Endorsement Quality Program will be considered equivalent to SSPC-QP 3.

The Engineer shall have 14 days to review the PQWP submittal after a complete plan has been received. No painting 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 reviewing 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.

Fresh, potable water with a maximum chloride content of 75 ppm and a maximum sulfate content of 200 ppm shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

Metal surfaces to be painted shall be dry blast cleaned in conformance with the requirements in 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 not 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 metal 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 metal 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.

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. Each PTFE bearing shall be tested for soluble salts. If levels of soluble salts exceed the maximum allowed by these special provisions, the Contractor shall perform additional cleaning and testing of blast cleaned surfaces until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 prior to blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, 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 14 days 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.

The color of the inorganic zinc coating shall match Federal Standard 595B, No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Stainless steel surfaces of PTFE bearings shall be masked off completely prior to application of inorganic zinc coating.

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 coat 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.

The total dry film thickness of all applications of inorganic zinc, 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.

Metal 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 at locations determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the inorganic zinc coating. 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 MPawhen measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. Adhesion testing shall conform to the following requirements:

    1. The Engineer shall select 2 locations per bearing for adhesion testing. If either of the locations tested fails to meet adhesion requirements, the bearing will be rejected.
    2. The Contractor, at the Contractor's expense, shall repair the rejected item 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. 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 shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

C. Dry to solvent insolubility for inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent used for testing of water borne inorganic zinc primers. The resistance rating shall be not less than 4. Each bearing shall be tested for dry to solvent insolubility. Inorganic zinc coating that does not meet the solvent insolubility 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.

D. Surface hardness of inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Each bearing shall be tested for surface hardness. 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.

Full compensation for cleaning and painting of PTFE spherical bearings shall be considered as included in the contract unit price paid for PTFE spherical bearing, and no separate payment will be made therefor.

10-1.92 CLEAN AND PAINT STRUCTURAL STEEL

New metal surfaces for the following facilities shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," Section 59-3, "Painting Galvanized Surfaces," and Section 91, "Paint," of the Standard Specifications and these special provisions:

1. Bike path railing and all components
2. Service platform components, which are specified in "Service Platform, " of these special provisions.
3. Barrier cover plate and all components
4. Pedestals at the bikepath landing.
5. Removable bollards.
6. Directional sign posts and frames.
7. Benches.
8. Trash receptacle.

GENERAL

Before performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in "Working Drawings," of these special provisions,, 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:

1. The name of each Contractor or subcontractor to be used.
2. 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.
3. 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.
4. Proposed materials, methods, and equipment to be used.
5. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3.

    5.1. In lieu of certification in conformance with the requirements in SSPC-QP 1 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 1.

6. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
7. Proposed methods to protect the coating during curing, shipping, handling, and storage.
8. Proposed rinse water collection plan.
9. A detailed paint repair plan for the repair of damaged areas.
10. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
11. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

Before submitting the PQWP, a prepainting meeting between the Engineer, the Contractor, and a representative from each entity performing painting for this project shall be held to discuss the requirements for the PQWP.

The Engineer shall have 20 days to review 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 reviewing 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.

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.

The Contractor shall provide enclosures to permit cleaning and painting during inclement weather. Provisions shall be made to control atmospheric conditions inside the enclosures within specified limits during cleaning and painting operations, drying to solvent insolubility, and throughout the curing period in accordance with the manufacturer's recommendations and these special provisions. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

CLEANING

New metal surfaces, except where galvanized, shall be dry blast cleaned in conformance with the requirements in 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 not less than 38 µm nor more than 90 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 before use for each shipment of blast cleaning material for steel.

The inside surfaces of bolt holes shall be cleaned in conformance with the requirements in SSPC-SP 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and visible rust shall be removed.

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.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 before blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

PAINTING

Blast cleaned surfaces shall receive a single undercoat of an inorganic zinc rich primer and a single finish coat of a polysiloxane paint approved by the manufacturer of the inorganic zinc coating.

The inorganic zinc rich primer shall conform 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 primers, and
2. The entire Section 5.6.1 shall not apply for either type of inorganic zinc primer.

Type I primers selected for use shall meet the current applicable volatile organic compound limits for the air district in which the project is located.

Inorganic zinc rich primer shall be selected from the Department's Pre-Qualified Products List.

The inside surfaces of bolt holes shall be painted with one application of a zinc rich primer (organic vehicle type) after the application of the undercoat of inorganic zinc on adjacent steel. The steel surfaces adjacent to the bolt holes shall be kept clean and protected from drippings during the application of the primer.

The color of the final application of inorganic zinc rich primer shall match color no. 36373 of FTD-STD-595.

Inorganic zinc rich primer shall be used within 12 hours of initial mixing.

Application of inorganic zinc rich primer shall conform to the provisions in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc rich primer 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 before application of inorganic zinc primer.

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 rich primer 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 rich primer to the specified thickness.

Steel surfaces coated with Type II inorganic zinc rich primer 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 rich primer 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 before 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 rich primer before 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 shall be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc rich primer. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc undercoat shall pass the following tests:

1. The undercoat shall have a minimum adhesion to steel of 4.0 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 rich primer 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.
2. Areas where finish coats are to be applied shall be tested by the Contractor for soluble salts using a cell 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 undercoat 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.
3. Before application offinish coats, the inorganic zinc undercoat 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 rich primer to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

1. The surface pH of the inorganic zinc undercoat 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.
2. 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 undercoat shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat 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 rich primer to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

1. 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 undercoat shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat 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 rich primer to the specified thickness.
2. Surface hardness of solvent borne inorganic zinc undercoat shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc undercoat shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc undercoat 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 rich primer to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of the inorganic zinc undercoat after repairs have been completed.

All areas of inorganic zinc undercoat 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 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 rich coating and water rinsing.

The single finish coat shall be an inorganic thermosetting hybrid coating based upon a polysiloxane resin coreacted or blended with an epoxy, acrylic, or urethane resin or combination thereof. The coating shall not contain any isocyanate or polyisocyanate components.

The surface of the undercoat shall be free from moisture, visible dust, visible grease, or other deleterious materials immediately before application of finish paint.

Galvanized or metallized surfaces designated to receive finish paint shall be cleaned in accordance with the requirements of SSPC-SP 1, "Solvent Cleaning," of the "SSPC: The Society for Protective Coatings," and then primed with a galvanized surface primer recommended by the manufacturer of the polysiloxane finish paint. The complete finish paint system on galvanized fasteners shall have a minimum adhesion rating of 4 when measured in accordance with ASTM Designation: D 3359.

The finish coat paint shall be formulated for application to inorganic zinc coating and shall conform to the following:

Test	Test Method	Requirement
Solvent Resistance (100 double rubs with Methyl Ethyl Ketone)	ASTM D 5402	No visible topcoat on cloth, no softening (ASTM D 3363)
Adhesion to primed steel	ASTM D 4541 (Type III, IV, or V)	5.0 MPa, minimum
Adhesion to Galvanized steel	ASTM D 3359, Procedure A (surface cleaned per SSPC-SP 1 and primed with manufacturer's recommended galvanized surface primer)	4 A, minimum
Dry-Through time	ASTM D 1640	8 hours, maximum
Abrasion Resistance (1,000 cycles, CS17 wheel, 1 Kg load)	ASTM D 4060	< 0.125 g loss
Mandrel Bend	ASTM D 522 (125 µm dry film applied to abraded steel plate)	No cracking on 12.7-mm mandrel
Water Resistance	ASTM D 870 (125 µm dry film on primed steel, cured 7 days)	No change in color or gloss after 7 days. Adhesion greater than 4.1 MPa after 48 hours recovery

In addition, the finish coat paint shall conform to the following requirements after exposure for 4,000 hours in conformance with the test procedures in ASTM Designation: D 4587, Cycle 2:

Test	Test Method	Requirement
Color retention	ASTM D 2244 (Color change in ΔE*)	< 2.0
Gloss reduction from original reading	ASTM D 523	10 percent, maximum

The finish coat shall be applied within 48 hours following water rinsing and passing the soluble salt testing requirements herein.

The 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: D 1640. The finish coat color shall be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat shall be not less than 125 µm.

Attention is directed to "Supplemental Project Information" of these special provisions regarding referee samples of the Federal Standard colors #27925 and #27880.

A test panel at least 600 mm x 600 mm in size shall be successfully completed at a location approved by the Engineer before beginning work on painting steel surfaces. The test panel shall be steel or other material as approved by the Engineer and shall be adequately cleaned. The test panel shall be painted with 2 applications of finish coat using the materials, equipment and methods to be used in painting steel surfaces. If ordered by the Engineer, additional test panels shall be provided until the specified color is 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 painted steel surfaces.

The total dry film thickness of all applications of inorganic zinc undercoat and finish coat paint shall be not less than 200 µm nor more than 325 µm.

Full compensation for cleaning and painting structural steel 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.

Full compensation for preparing paint test panels 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.

10-1.93 ROCK SLOPE PROTECTION (SPLASH PAD)

Rock slope protection (Splash Pad) shall be Class 3 permeable material for drainage splash pad at locations shown on the plans shall be constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions, and as directed by the Engineer.

MATERIALS

Rock slope protection fabric shall be geotextile reinforcement fabric, and shall conform to "Geotextile Reinforcement Fabric," of these special provisions.

Rock slope protection materials shall be Class 3 permeable material free from vegetable matter and other unsuitable material, and shall conform to the following gradation:

Grading Requirements

Sieve Sizes	Percentage Passing
37.5-mm	100
25-mm	88-100
19-mm	52-85
9.5-mm	15-38
4.75-mm	0-16
2.36-mm	0-6

Class 3 permeable material shall have a Durability Index of not less than 40.

At least 90 percent by mass of Class 3 permeable material shall be crushed particles as determined by California Test 205.

PLACEMENT

The Contractor shall construct the rock slope protection to the approximate designated dimensions and established grade elevations, in conformance with the details shown on the plans.

MEASUREMENT AND PAYMENT

Class 3 permeable material will be measured by the cubic meter computed from the dimensions shown on the plans.

Rock slope protection (Splash Pad) will be measured and paid for as Class 3 permeable material.

Full compensation for providing trench excavation for rock slope protection (splash pad) is included in the contract price paid per cubic meter for Class 3 permeable material and no separate payment will be made therefor.

10-1.94 GEOTEXTILE FILTER FABRIC

Geotextile filter fabric shall be furnished and installed at the locations of reconstruct rock slope protection (1T, Method B) and at rock slope protection (splash pad), as shown on the plans, in conformance with these specifications, and as directed by the Engineer.

Geotextile filter fabric shall be manufactured from polyester or polypropylene.

Geotextile filter fabric shall be nonwoven and shall conform to the following:

A.

Property	Value	ASTM Test Designation
Minimum Grab Tensile Strength	1.1 kN	D4632
Minimum Elongation at Break	50%	D4632
Maximum Apparent Opening Size	0.21 mm	D4751
Minimum Permittivity	0.5 sec-1	D4491

B. Geotextile rolls shall be furnished with suitable wrapping for protection against moisture, ultraviolet exposure and abrasion during shipping. Each roll shall be labeled or tagged to provide product identification sufficient for field identification as well as inventory and quality control purposes. Rolls shall be stored in a manner that protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

C. The amount of geotextile placed shall be limited to that amount which can be covered with the specified material within 72 hours.

D. Installation sites shall be prepared by clearing, grubbing and excavation or filling to the design grades. The surface upon which the geotextile filter fabric is to be placed should be graded smooth and be free of debris and large depressions.

E. Geotextile fabric shall be handled and placed in accordance with the manufacturer's recommendations and these specifications. The geotextile shall be laid transverse to the roadway alignment (i.e., geotextile roll or machine direction perpendicular to roadway centerline) and shall be placed loosely without folds. The ends of subsequent rolls and/or parallel rolls of geotextile should be overlapped a minimum of 300 mm prior to sewing. The fabric shall be stitched with a yarn of a contrasting color. The size and composition shall be as recommended by the fabric manufacturer. The stitches shall number 5 to 7 per 25 mm of seam. Lock type stitch shall be used.

F. Vehicles or equipment shall not be driven directly on the geotextile fabric. A minimum of 200 mm cover shall be maintained between the compaction equipment and the fabric.

G. The contractor shall patch holes in the geotextile as directed by the Engineer. Repairs shall be performed by placing a new piece of fabric over the damaged area that extends beyond the damaged area in all directions a minimum overlap of 300 mm and heat bonding in place. If damage is greater that one square meter the damaged section shall be cut out and shall be replaced with a new piece of geotextile filter fabric material, in according to the fabric overlap and stitches requirement, as directed by the Engineer. Damage to the geotextile fabric resulting from the Contractor's vehicles, equipment or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Geotextile fabric will be measured by square meters computed from the payment lines shown on the plans, excluding seam overlaps.

The contract price paid per square meter for geotextile filter fabric shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing the fabric, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.95 MISCELLANEOUS CONCRETE CONSTRUCTION

Curbs, sidewalks, and curb rampsshall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

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 furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

Aggregate for minor concrete (paving) shall conform to the grading specified for fine aggregate in Section 90-3.03, "Fine Aggregate Grading," of the Standard Specifications. Aggregate for grout shall conform to the following grading:

Sieve Sizes	Percentage Passing
4.75-mm	100
2.36-mm	90 - 100
1.18-mm	60 - 100
600-µm	35 - 70
300-µm	15 - 35
150-µm	2 - 15

The concrete shall be screeded to the required grade and cross section and floated to a uniform surface.

The broom finish for the minor concrete (paving) shall be applied to the surfaces while the concrete is still in the plastic stage of set.

Site conditions within the minor concrete (paving) areas may vary. The Contractor shall prepare the site for minor concrete (paving) areas. Site preparation shall include, but not be limited to, forming work, minor grading, saw cutting asphalt concrete to provide a clean edge, sleeving of posts or reflectors within the minor concrete (paving) areas and adjusting existing pull boxes to grade in conformance with the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications. Gaps between the cured concrete and existing asphalt concrete surfacing shall be filled with asphalt concrete. Asphalt concrete shall conform to the provisions in "Hot Mix Asphalt" of these special provisions. For payment purposes, the area in square meters of minor concrete (paving) will be determined from horizontal measurements of the finished textured paving.

The contract price paid per cubic meter for minor concrete (paving) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing minor concrete (paving), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.96 CURB RAMP DETECTABLE WARNING SURFACE

GENERAL

Summary

This work includes installing detectable warning surface on the bikepath landing, along the bikepath (BP Line), as shown on the plans, and as specified in these special provisions.

MATERIALS

Curb ramp detectable warning surface

Curb ramp detectable warning surface must be:

1. Yellow color complying with Federal Standard 595B, Color No. 33538
2. Prefabricated
3. Raised truncated domes

The manufacturer must provide a written 5-year warranty for detectable warning surface, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period will begin upon acceptance of the contract.

CONSTRUCTION

Installation of curb ramp detectable warning surface must comply with the manufacturer's recommendations.

Full compensation for installing detectable warning surface is included in the contract price paid per cubic meter for minor concrete (minor structure) for bikepath ramp and landing and no separate payment will be made therefor.

10-1.97 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. Pull box frames and covers
B. Soffit access opening steel gratings
C. Ladder assembly at deck access openings
D. Pedestals for bikepath landing light poles and fixtures
E. Modifications to secure existing soffit access openings.

Steel shapes, plates, and other metal parts designated in the plans as stainless steel shall conform to the requirements of ASTM Designation: A 276, Type 316.

Pullbox frames and covers shall conform to the provisions in Section 86-2.07, "Traffic Pull Boxes," of the Standard Specifications and these special provisions.

Pedestals for bikepath landing light poles and fixtures shall be cleaned and painted in accordance with the provisions for painting galvanized surfaces in "Clean and Paint Structural Steel," of these special provisions.

Full compensation for cleaning and painting pedestals for bikepath landing light poles and fixtures shall be considered as included in the contract price paid per kilogram for miscellaneous metal (bridge) and no additional compensation will be allowed therefor.

10-1.98 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 316.

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.

Pipe hanger assembly

Pipe hanger assembly shall consist of steel hangers, anchor bolts, pipe clamps, nuts and bolts, and embedded steel plates, and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. All parts shall be galvanized. The pipe hanger assembly shall be suitable for the type and size of pipe installed and shall be as shown on the plans.

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. The sleeve connections shown on the plans shall not be used for either PVC plastic pipe or fiberglass pipe.

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 pipe hanger assemblies shall be considered as included in the contract price paid per kilogram for bridge deck drainage system and no additional compensation will be allowed therefor.

10-1.99 MISCELLANEOUS METAL (RESTRAINER-CABLE TYPE)

Miscellaneous metal (restrainer-cable type) shall conform to the provisions for bridge joint restrainer units in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications and these special provisions.

New concrete adjacent to restrainers shall be placed prior to installing restrainers.

Miscellaneous metal (restrainer-cable type) will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (restrainer) in Sections 75-1.06, "Measurement," and 75-1.07, "Payment," of the Standard Specifications.

10-1.100 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.

Metal beam guard railing elements and required backup plates, terminal sections, end caps, and return caps shall conform to the requirements of Type 2 W-Beam as shown in AASHTO Designation: M 180.

10-1.101 WELDED WIRE STEEL RAILING

Welded wire steel railing shall conform to the details shown on the plans and the provisions in Section 83-l, "Railings," of the Standard Specifications and these special provisions.

SUBMITTALS

The Contractor shall submit the Manufacturer's descriptive data, material specifications and layout drawings for the welded wire steel railing and accessories for the Engineer's approval.

MATERIALS

General.--All ferrous materials shall be new and galvanized. Posts, caps, braces and other rolled or formed elements shall be hot-dip galvanized and powder coated after rolling or forming.

Style, finish, and color of each railing post shall match that of the other railing components.

Posts

Tubular steel posts shall conform to ASTM: A500, Grade B, galvanized. Tubing shall be painted and finished to match the post. The nominal thickness of the tubular steel post before galvanizing shall be 1.55 mm. Rainproof caps shall be furnished for tubular posts.

Fence Post Connection

The anchors for securing the fence post connection to the existing barrier shall be Hilti "HIT HY-150" stainless steel adhesive anchors or approved equal. Steel plates shall conform to ASTM A361A 36M, galvanized. Plates shall be painted and finished to match the post. Bolts for the stainless steel fasteners (alloys 304 and 316) shall conform to ASTM F593 or ASTM F738M. Washers for the stainless steel fasteners shall conform to ASTM A240 and B18.22M. Drill holes for the concrete anchors shall be drilled and cleaned in conformance with the anchor manufacturer's requirements.

Panels

Panels shall conform to ASTM A185, and shall be welded wire steel, 6-gage (4.88 mm), Class 1 galvanized wire 150 g/m^2. The wire tensile strength shall be 515 MPa, with a breaking strength of 14 kN. The color of the welded wire steel railing shall be black polyester powder coated to a 100 µm minimum thickness, measured by ASTM D1186 Method.

INSTALLATION

Posts for welded wire steel railing shall be set vertically and shall be connected to the existing concrete barrier as detailed in the plans.

Railing shall be erected in straight lines between angle points and shall conform closely to the horizontal and vertical lines shown on the plans or ordered by the Engineer.

Shim shall be installed between the posts and tube steel connection members, where necessary, to provide a snug tight fitting at the posts.

PAYMENT

The contract price paid per meter for welded wire steel railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in welded wire steel railing, complete in place, including furnishing connections for welded wire steel railing, drilling anchor bolt holes and anchoring bolts, steel plates and tubular steel for railings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.102 BIKEPATH RAILING

Bikepath railing shall conform to the provisions in Section 83-1.02G(2), "Metal Railing (Tubular)," of the Standard Specifications and these special provisions.

Posts shall conform to the requirements in ASTM designation: A500, Grade C.

Stainless steel plates shall conform to the requirements in designation: ASTM A167, Type 316.

Stainless steel bolts shall conform to the requirements in designation: ASTM F593, Group 2, Type 316 or 316L. Dielectric material utilized for separating stainless steel components from carbon steel components shall be ultra high molecular weight (UHMW) material.

The UHMW material shall have a molecular weight of 3,000,000 to 6,000,000 in accordance with ASTM Designation: D 4020, compression molded, stress relieved, and include an ultraviolet stabilizer. Physical characteristics shall conform to the following requirements:

A. Static coefficient of friction to steel (dry) shall be less than 0.025.
B. Specific gravity shall be greater than 0.92 (ASTM Designation: D 792)
C. No water absorption shall be shown under long term immersion (ASTM Designation: D 510)
D. The minimum tensile stress capacity shall be 25 MPa and the minimum impact shear capacity shall be 10 MPa.

Railing grill shall conform to the provisions in Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications. After galvanizing, the railing grill shall be free of fins, abrasions, rough or sharp edges and other surface defects and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done by methods approved by the Engineer. Kinks, twists or bends in the railing grill may be cause for rejection of the railing grill.

All metal surfaces of bikepath railing, including railing grill and all components, shall be hot-dip galvanized after fabrication in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. All exposed galvanized metal surfaces shall be cleaned and painted in conformance with the provisions for painting galvanized surfaces in "Clean and Paint Structural Steel" of these special provisions.

Attention is directed to "Welding" of these special provisions.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding and polishing. Prior to welding, the manufacturer must submit a complete weld procedure to the Engineer for approval.

The Contractor shall submit working drawings in conformance with the provisions in "Working Drawings" of these special provisions.

MEASUREMENT AND PAYMENT

Bikepath railing will be measured by the meter from end to end along the face of railing, including end and intermediate posts, and with no deductions for gaps in railing for lighting and sign supports or additions for overlaps at the expansion joints.

The contract price paid per meter for bikepath railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing bikepath railing, complete in place, including stainless steel bolts, washers and caps, steel shims, and cleaning and painting of metal surfaces, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.103 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in "Epoxy-Coated Prefabricated Reinforcement," of these special provisions.

Where existing reinforcement is incorporated into new concrete, any existing wrapping or grease shall be removed from reinforcement and both existing concrete and reinforcement shall be cleaned of all loose material, and any damage to the existing epoxy-coated reinforcement shall be repaired prior to casting new concrete in conformance with the provisions in "Reinforcement" of these special provisions.

Full compensation for epoxy-coated bar reinforcement shall be considered as included in the contract price paid per meter for concrete barrier of the type or types listed in the Engineer's Estimate and no separate payment will be made therefor.

Concrete barrier (Type 732A Mod) will be measured and paid for as concrete barrier (Type 732 Mod).

Full compensation for removing existing wrapping or grease from existing reinforcement, and repairing damage to the existing epoxy-coated reinforcement, shall be considered as included in the contract price paid per meter for concrete barrier (Type 732 Mod) and no additional compensation will be allowed therefor.

BARRIER COVER PLATE

Structural steel plates and hardware required for barrier cover plate to join concrete barrier at expansion joints shall conform to the details shown on the plans and to the provisions for materials, fabrication and galvanizing, in Sections 75-1.03, "Miscellaneous Bridge Metal," and 75-1.05, "Galvanizing," of the Standard Specifications.

Attention is directed to "Welding Quality Control" in "Welding," of these special provisions.

Steel plate barriers shall be cleaned and painted in accordance with the provisions for painting galvanized surfaces in "Clean and Paint Structural Steel" of these special provisions.

Barrier cover plates including hardware used to form barriers at new and existing bridge expansion joints will be measured and paid for as concrete barrier (Type 732 Mod).

Full compensation for cleaning and painting barrier cover plates shall be considered as included in the contract price paid per meter for concrete barrier (Type 732 Mod) and no separate payment will be made therefor.

10-1.104 CRASH CUSHION, SAND FILLED

Sand filled crash cushions shall be furnished and installed as shown on the plans and in conformance with these special provisions.

A sand filled crash cushion shall consist of a grouping of sand filled modules.

Crash cushions shall be installed at the following locations:

WB-80, (Lt.) Station W 92+73.

At the Contractor's option, modules for use in sand filled 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 Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205

   2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
   2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786

Modules contained in the 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 exterior components of the modules shall be formulated or processed to resist deterioration from ambient ultraviolet rays. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects.

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 crash cushions comply with the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

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 placed on bridge decks shall be provided with positioning blocks fastened to the deck surface. Positioning blocks shall be shaped as segments of a ring and placed along the inner or outer periphery of the module wall. A minimum of 2 blocks, a minimum of one-sixth of a ring in length shall be provided for each module. Positioning blocks and fasteners shall be of a material that is corrosion and water resistant.

Module cylinders 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.

Lids shall be securely attached as recommended by the manufacturer.

A Type R or Type 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 approved by the Engineer.

Sand filled crash cushions, regardless of the number of modules required in each sand filled crash cushion, will be measured and paid for by the unit as crash cushion, sand filled. The quantity to be paid for will be determined from actual count of the units in place in the completed work.

The contract unit price paid for crash cushion, sand filled shall include full compensation for furnishing all labor, materials (including sand and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushions, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.105 REMOVABLE BOLLARD

GENERAL

Summary

This work includes furnishing and installing removable bollards as shown on the plans and as specified in the Standard Specifications and theses special provisions.

Submittals

Submit a Certificate of Compliance to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

MATERIALS

Removable bollards must be galvanized 100 mm diameter standard pipe and comply with ASTM A53, Type S, Grade B, Schedule 40, as shown on the plans. The inside diameter of sleeves for removable bollards must be 2.5 mm greater than the outside diameter of the post.

Removable bollard, and sleeves must be fitted with a steel flange or eyebolt, welded to the bollard and sleeve, capable of accommodating a padlock as shown on the plans. Welding must comply with the requirements under "Welding" of these special provisions. Welds on exposed surfaces must be ground smooth and flush with adjacent surfaces.

Removable bollards and all metal components must be hot dipped galvanized after fabrication in accordance with ASTM A123.

Concrete

Concrete must be Class 3 or minor concrete and comply with the provisions under Section 90 "Portland Cement Concrete," of the Standard Specifications.

Permeable Material

Permeable material must be Class 2 and conform with the details shown on the plans, and to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

CONSTRUCTION

Install removable bollards in a vertical position, plumb, on true alignment and grade, and to dimensions as shown on the plans.

Remove loose dirt around post holes and tamp prior to placing posts and concrete.

Place permeable material and concrete into the excavation as shown on the plans, and crown 25 mm above grade to shed water away from the post. Brace removable bollards as required, to ensure post remain vertical, plumb and in the design location.

The finish coat for removable bollards must conform to the provisions in "Clean and Paint Structural Steel," of these special provisions.

The finish coat must be applied in 2 applications. The first application must consist of a spray applied mist application. The second application must 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: D 1640. The finish coat color must be equal blend of Federal Standard colors, # 27925 and #27880. The total dry film thickness of both applications of the finish coat must be not less than 125 µm.

Surfaces to be painted must be prepared and paint applied as follows:

1. Exposed surfaces must be clean of all grease, oil, mill scale, dirt, concrete, rust, old paint or any other contaminants.
2. Prime coat must be applied at 3.0 – 4.0 mils Dry Film Thickness.
3. The top coat must be applied each at 1.5 mils Dry Film Thickness. A minimum of 24 hours must be allowed between coats for the preceding coat to dry completely.
4. Protect adjacent surfaces from exposure to or damage by overspray and airborne paint particles.
5. Do not be apply paint when the air temperature in the shade is below 40°F or when the surface is wet. Paint must not be applied when inclement weather conditions are pending. Contractor must repaint if weather affects drying.

Place yellow reflective tape as shown on the plans. Reflective tape must comply with "Retroreflective Sheeting" of these special provisions.

Provide padlocks for each removable bollard and at least 2 sets of keys to the Engineer.

MEASUREMENT AND PAYMENT

Quantities of removable bollard to be paid for by the unit are determined from actual count in place.

The contract unit price paid for removable bollard includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing removable bollards, complete in place, including padlocks and keys, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.106 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

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 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

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 StripeThickness (mm)	Minimum Application Rate (kg/m)
2.0	0.4

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.

10-1.107 PAINT TRAFFIC STRIPE AND PAVEMENT MARKING

Painted traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

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 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

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.

10-1.108 PARKING BUMPER

Parking bumpers shall be furnished and installed at the locations and in the manner shown on the plans.

Parking bumpers shall be precast with concrete and reinforcing steel as shown on the plans. Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Concrete shall contain not less than 280 kg of cementitious material per cubic meter. Parking bumpers may be commercially available precast concrete bumpers conforming to the details shown on the plans. Minor variations in cross section dimensions will be acceptable in commercially available units.

Dowels shall be commercial quality reinforcing steel or mild steel rods.

Parking bumpers will be measured by the unit as determined from actual count in place.

The contract unit price paid for parking bumper (precast concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing precast concrete parking bumpers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.109 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

10-1.110 BENCH AND TRASH RECEPTACLE

GENERAL

This work includes furnishing and installing benches and trash receptacles at the locations shown on the plans and as specified in the standard specification and these special provisions.

Benches and trash receptacles must be prefabricated and factory assembled by the same manufacturer and from one of the following manufacturers:

1. Bench

   1.1. Model "Petoskey - Support Backed Bench or equal ," with a 16 mm solid metal round bar seat insert, as manufactured by Landscapeforms, 431 Lawndale Ave. Kalamazoo, Ml 49048, telephone 1-(800)-521-2548.
   1.2. Model "Genova" with a 16 mm solid metal round bar seat insert or equal , as manufactured by Thomas Steele division of Trilary, Inc, Preeminence P.O.Box 1141 Seaford, DE 19973, telephone 1-(800)-401-1388.
   1.3. Model number 137-60,as manufactured by Dumor or equal , Ross Recreation Equipment Co 100 Brush Creek Road, Suite 206 Santa Rosa, Ca 954054, telephone (707) 538-3800.

2. Trash Receptacle

   2.1. Model "Petoskey" - steel trash receptacle or equal, as manufactured by Landscapeforms, 431 Lawndale Ave. Kalamazoo, Ml 49048, telephone 1-(800)-521-2548.
   2.2. Model "Genova" GNTR - 32 steel trash receptacle or equal with a dome lid, as manufactured by Thomas Steele division of Trilary, Inc, Preeminence P.O.Box 1141 Seaford, DE 19973, telephone 1-(800)-401-1388.
   2.3. Model series 158-32, as manufactured by Dumor or equal, Ross Recreation Equipment Co 100 Brush Creek Road, Suite 206 Santa Rosa, Ca 954054, telephone (707) 538-3800.

Finish Coat

The finish coat for benches and trash receptacles must conform to the provisions in "Clean and Paint Structural Steel," of these special provisions.

The finish coat must be applied in 2 applications. The first application must consist of a spray applied mist application. The second application must 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: D 1640. The finish coat color must be equal blend of Federal Standard colors # 27925 and #27880. The total dry film thickness of both applications of the finish coat must be not less than 125 µm.

Submittals

Submit a Certificate of Compliance for benches to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a copy of the Manufacturer's warranty.

CONSTRUCTION

Benches and trash receptacles must be installed and anchored to the finish grade in accordance with the manufacturer's specifications.

Clean benches promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that could damage finish.

Minor damage to bench or trash receptacle during loading, shipping, and installation as determined by the Engineer must be repaired in accordance with manufacturer's specifications at the Contractor's expense, and must be approved by the Engineer.

Damage to bench or trash receptacle beyond repair as determined by the Engineer, during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of bench to be paid for by the unit are determined from actual count in place.

Quantities of trash receptacle to be paid for by the unit are determined from actual count in place.

The contract unit price paid for bench includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing benches, complete in place, including storing and transporting benches, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for trash receptacle includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing trash receptacles, complete in place, including storing and transporting trash receptacles, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

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.

When fluctuations of water pressure and water supply are encountered during normal working hours, plants shall be watered at other times, as often, and in sufficient amounts as conditions may require to keep the soil and plant roots moist during the life of the contract.

Full compensation for watering plants outside normal working hours shall be considered as included in the contract lump sum prices paid for highway planting and plant establishment work and no additional compensation will be allowed therefor.

PROGRESS INSPECTIONS

Progress inspections will be performed by the Engineer for completed highway planting and irrigation system work at designated stages during the life of the contract.

Progress inspections will not relieve the Contractor of responsibility for installation in conformance with the special provisions, plans and Standard Specifications. Work within an area shall not progress beyond each stage until the inspection has been completed, corrective work has been performed, and the work is approved, unless otherwise permitted by the Engineer.

The requirements for progress inspections will not preclude additional inspections of work by the Engineer at other times during the life of the contract.

The Contractor shall notify the Engineer, in writing, at least 4 working days prior to completion of the work for each stage of an area and shall allow a minimum of 3 working days for the inspection.

Progress inspections will be performed at the following stages of work:

A. During pressure testing of the pipelines on the supply side of control valves.
B. During testing of low voltage conductors.
C. Before planting begins and after completion of the work specified for planting in Section 20-4.03, "Preparing Planting Areas," of the Standard Specifications.
D. Before plant establishment work begins and after completion of the work specified for planting in Section 20-4.05, "Planting," of the Standard Specifications.
E. At intervals of one month during the plant establishment period.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. Cost break-down tables will be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

HIGHWAY PLANTING COST BREAK-DOWN

Contract No. 04-0120M4

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
ROADSIDE CLEARING	LS	LUMP SUM		
CULTIVATE	M2	9570		
SOIL AMENDMENT	M3	518		
COMMERCIAL FERTILIZER (SLOW RELEASE)	KG	2503		
MULCH	M3	1062		
PLANT (GROUP A)	EA	4699		
PLANT (GROUP B)	EA	1234		
PLANT (GROUP I)	EA	3274		
PLANT (GROUP K)	EA	34		
PLANT (GROUP M)	EA	100221		
PLANT (GROUP U)	EA	43		
PLANT (GROUP Z)	EA	62		

TOTAL _____

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 04-0120M4

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
CONTROL AND NEUTRAL CONDUCTORS (ARMOR-CLAD)	LS	LUMP SUM		
25 mm ELECTRIC REMOTE CONTROL VALVE	EA	26		
32 mm ELECTRIC REMOTE CONTROL VALVE	EA	32		
40 mm ELECTRIC REMOTE CONTROL VALVE	EA	16		
12-STATION IRRIGATION CONTROLLER (WALL MOUNTED)	EA	1		
24-STATION IRRIGATION CONTROLLER (WALL MOUNTED)	EA	2		
36-STATION IRRIGATION CONTROLLER (WALL MOUNTED)	EA	1		
20 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	6160		
25 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	1940		
32 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	2780		
40 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	3070		
50 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	940		
75 mm PLASTIC PIPE (PR200) (SUPPLY LINE)	M	1780		
SPRINKLER (TYPE A-6)	EA	160		
SPRINKLER (TYPE B-2)	EA	620		
SPRINKLER (TYPE B-4)	EA	130		
SPRINKLER (TYPE C-2)	EA	1370		
SPRINKLER (TYPE C-2 MOD)	EA	250		
SPRINKLER (TYPE D-3)	M	15,990		
40 mm BALL VALVE	EA	1		
50 mm BALL VALVE	EA	8		
75 mm BALL VALVE	EA	1		
32 mm GATE VALVE	EA	1		
50 mm GATE VALVE	EA	1		

75 mm GATE VALVE	EA	8		
32 mm WYE STRAINER	EA	2		
40 mm WYE STRAINER	EA	5		
50 mm WYE STRAINER	EA	5		
75 mm WYE STRAINER	EA	1		
20 mm QUICK COUPLING VALVE	EA	16		
25 mm AIR RELEASE VALVE	EA	20		
FLUSH VALVE	EA	30		
IRRIGATION CONTROLLER ENCLOSURE CABINET (DOUBLE)	EA	2		
RECYCED WATER WARNING SIGNS	EA	LUMP SUM		
FILTER ASSEMBLY UNIT	EA	11		

TOTAL _____

10-2.02 (BLANK)

10-2.03 (BLANK)

10-2.04 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

HIGHWAY PLANTING MATERIALS

Mulch

Mulch must be wood chips.

Commercial Fertilizer (Slow Release)

Commercial fertilizer (slow release), for all plants except palm trees, shall be a pelleted or granular form, shall be slow or controlled release with a nutrient release over an 8- to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen	16-21
Phosphoric Acid	6-8
Water Soluble Potash	4-10

Commercial fertilizer for palm trees shall be a pelleted form, slow or controlled release with a nutrient release over an 6 to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen Water Soluble Organic 0.92% Water Insoluble Organic 8.08%	9
Available Phosphoric Acid	3
Soluble Potash Soluble Potash 1.10% Slowly Available Potash 7.9%	9

ROADSIDE CLEARING

Prior to preparing planting areas, mulch areas, commencing irrigation trenching operations for planting areas, trash and debris shall be removed from the entire highway right of way within the project limits, excluding paved areas, and medians.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

A. Weeds shall be killed and removed within proposed mulch areas and within the area extending beyond the outer limits of the proposed mulch areas to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, existing planting and fences. At those locations where proposed mulch areas are 3.6 m or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, and fences, the clearing limit shall be 2 m beyond the outer limits of the proposed mulch areas.
B. Weeds shall be killed and removed within 0.6-m of the edges of paved shoulders, dikes, curbs and sidewalks.
C. Weeds shall be killed and removed within planting areas where plants are to be planted in groups or rows 4.6 m or less apart and from within an area extending 2 m beyond the outer limits of the groups or rows of plants.
D. Weeds shall be killed and removed within an area 2 m in diameter centered at each plant location where the plants are to be planted more than 4.6 m apart and are located outside of ground cover areas.
E. Weeds shall be killed and removed within an area 0.6-m in diameter centered at each liner or seedling plant location where the plants are planted more than 3 m apart. At locations where liner or seedling plants are to be planted less than 3 m apart, weeds shall be killed and removed within the entire area.
F. Weeds shall be killed and removed from within areas where , rock blankets are to be placed.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

A. Trash and debris shall be removed.
B. Rodents shall be controlled.
C. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 150 mm in length, whichever occurs first, except for weeds in wild flower seeding areas to be mowed.
D. Weeds in plant basins, including basin walls, shall be removed by hand pulling, after the plants have been planted.

Weed Control

Weed control shall also conform to the following:

A. Stolon type weeds shall be killed with glyphosate.
B. Tumbleweeds shall be removed by hand pulling before the tumbleweeds reach a height of 150 mm.
C. Removed weeds and ground cover shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
D. Areas to be mowed shall be mowed when weed height exceeds 300 mm. Weeds shall be mowed to a height of 50 mm to 150 mm.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

PESTICIDES

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Diquat
Glyphosate
Sethoxydim
Oxadiazon - 50 percent WP (Preemergent)
Oryzalin (Preemergent)
Pendimethalin (Preemergent)
Trifluralin (Preemergent)
Melfluidide (Growth regulator)

Granular preemergents may be used when applied to areas that will be covered with mulch, excluding plant basins. Granular preemergents shall be limited to the following materials:

Dichlobenil (Preemergent)
Oxadiazon (Preemergent)

Granular preemergents shall be applied prior to the application of mulch. Mulch applications shall be completed in these areas on the same working day. Photosensitive dye will not be required.

Glyphosate shall be used to kill stolon type weeds.

Prior to the application of preemergents, ground cover and liner plants shall have been planted a minimum of 3 days and shall have been thoroughly watered.

A minimum of 100 days shall elapse between applications of preemergents.

Except for liner and ground cover plants, preemergents shall not be applied within 450 mm of plants.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Pesticides shall not be applied within the limits of the plant basins. Pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

PREPARING PLANTING AREAS

Plants adjacent to drainage ditches shall be located so that after construction of the basins, no portion of the basin walls shall be less than the minimum distance shown on the plans for each plant involved.

CULTIVATE

Areas shown on the plans to be cultivated shall be cultivated.

Immediately prior to cultivation, soil amendment and commercial fertilizer shall be added to the areas to be cultivated. Soil amendment shall be added at the rate 0.04 cubic meter per square meter and commercial fertilizer shall be applied at the rate of 7 kilograms per 100 square meters. Soil amendment and fertilizer shall be thoroughly mixed with the soil.

After cultivation is complete and the irrigation systems have been installed and the plant holes have been excavated and backfilled, no further planting work shall be done in the cultivated areas for a period of 30 days, except the soil shall be kept sufficiently moist to germinate weeds. Weeds that germinate shall be killed.

PLANTING

Plant holes within areas of lightweight cellular concrete fill, as shown on the plans, shall be excavated with hand tools only. The excavation depth shall not be greater than 600 mm.

Backfill material for plant holes shall be a mixture of soil and soil amendment. Backfill material for plant holes within areas of lightweight cellular concrete fill shall be a mixture of imported topsoil and soil amendment. The quantity of soil amendment shall be as shown on the Plant List. Soil amendment shall conform to the provisions in Section 20-2.03, "Soil Amendment," of the Standard Specifications. Backfill material shall be thoroughly mixed and uniformly distributed throughout the entire depth of the plant hole without clods and lumps.

Commercial fertilizer (pelleted and granular) shall be applied or placed at the time of planting and at the rates shown on the Plant List and in conformance with the provisions in Section 20-4.05, "Planting," of the Standard Specifications and these special provisions.

A granular preemergent shall be applied to areas to be covered with mulch outside of plant basins in conformance with the provisions in "Pesticides" of these special provisions.

Mulch placed in areas outside of plant basins shall be spread to a uniform depth of 75 mm.

Mulch shall be spread from the outside of the proposed plant basin to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, fences, and existing plantings. If the proposed plant material is 3.6 m or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, fences, and other existing plantings, the mulch shall be spread 2 m beyond the outside edge of the proposed plant basins.

Mulch shall not be placed within one meter of the centerline of earthen drainage ditches, within one meter of the edge of paved ditches, and within one meter of the centerline of drainage flow lines.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Planting shall not be performed in an area until the functional test has been completed for the irrigation system serving that area.

LINER PLANTS (PLANT GROUP M)

Liner plants shall be furnished in containers with a minimum size of 50 mm diameter by 100 mm deep. Liner plant containers made of biodegradable material shall not be used. All liner plants shall be removed from their containers at the time of planting.

Liner planting shall be performed after cultivation. Planting holes for liner plants shall be large enough to accommodate the total length and width of the roots.

POT PLANTS (PLANT GROUP I)

Pot plants shall be furnished in containers with a minimum size of 100 mm by 100 mm by 150 mm deep. Pot plant containers made of biodegradable material shall not be used. All pot plants shall be removed from their containers at the time of planting.

Planting holes for pot plants shall be large enough to accommodate the total length and width of the roots, commercial fertilizer packet, and soil amendments.

PALM TREES

Palm trees shall be planted as shown on the plans and in conformance with the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

Palm trees shall have a minimum brown trunk height as shown on the plans. Dead fronds and frond stubs shall be removed from the trunk. In addition, green fronds shall be removed up to 2 rows of fronds away from the center growth. Sterilize all tools prior to removing fronds and treat all pruning cuts with fungicide. The 2 remaining rows of fronds shall be tied in an upright position with light hemp or manila rope. Fronds and frond stubs for Phoenix dactylifera (Date Palm) shall be removed approximately 100 mm from the trunk. Other fronds and frond stubs shall be removed at the trunk in a manner that will not injure the tree trunk.

Planting palm trees shall be performed between March 15 and October 15 unless otherwise directed by the Engineer.

Palm trees shall be planted the same day they are delivered. If planting cannot be performed on the same day as palm trees are delivered, palm trees shall be stored on site and maintained as directed by the Engineer.

The diameter and depth of each root ball shall be a minimum of 200 mm larger than the trunk diameter at the ground line. Exposed root balls shall be kept covered with wet burlap or canvas until the trees are planted.

Palm trees shall not be dragged and the trunks shall be protected from injury.

Each planting hole shall conform to the details shown on the plans.

Palm trees shall be placed in plant holes with their vertical axis in an upright and plumb position as shown on the plans.

Backfill material for the palm tree planting holes shall be plaster sand conforming to the following grading limits:

Sizing Requirements

Sieve Sizes	Percent Passing
9.5-mm	100
4.75-mm	93-100
2.36-mm	61-66
1.18-mm	66-13
600-µm	35-12
300-µm	14-9
150-µm	11-15
75-µm	0-10

Before backfilling plant hole, place 0.6 cubic meter of drain rock at the base of the plant hole and over drain sump, as shown on the plans.

Commercial fertilizer (slow release) shall be mixed with backfill at the rate of 3 kilograms per cubic meter. Backfill material and fertilizer shall be thoroughly mixed and uniformly distributed in the hole without clods and lumps.

After the planting holes have been backfilled, water shall be applied to the full depth of the backfill soil.

Watering basins for the palm trees shall be constructed as shown on the plans.

When the palm trees are planted, a root stimulant, approved by the Engineer, shall be applied to the roots of each palm tree in conformance with the printed instructions of the root stimulant manufacturer. A copy of the printed instructions shall be furnished to the Engineer before applying a stimulant. Root stimulant to be used shall be submitted to the Engineer not less than 2 weeks prior to the stimulant's intended use. Root stimulants not approved by the Engineer shall not be used.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 360 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Commercial fertilizer (slow release) shall be applied to trees, palms, shrubs, and ground cover during the first week of April and October of each year. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

The center to center spacing of replacement plants for unsuitable liner plants shall be determined by the number of completed plant establishment working days at the time of replacement and the original spacing in conformance with the following:

ORIGINAL SPACING (Millimeters)	SPACING OF REPLACEMENT GROUND LINER AND POT PLANTS (Millimeters)		
	Number of Completed Plant Establishment Working Days		
	1-125	126-190	191-End of Plant Establishment
200	200	150	150

Weeds within plant basins, including basin walls , shall be controlled by hand pulling.

Weeds within mulched areas and outside of plant basins shall be controlled by killing.

Weeds outside of mulched areas, plant basins, , the median, and paved areas shall be controlled by mowing. At locations where proposed planting areas are 3.6 m or more from the edges of existing plantings to remain and from shoulders, dikes, curbs, sidewalks, fences, and walls, the mowing limit shall be 2 m beyond the outer limits of the proposed planting area.

At the option of the Contractor, a growth regulator may be applied to mowed areas, provided the growth regulator is approved in advance by the Engineer and the growth regulator is applied in conformance with these special provisions.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period.

After 125 working days of the plant establishment period have been completed, replacement of plants, except for liner and pot plants, shall be No. 5 size for No. 1 size plants; No. 15 size for No. 5 size plants; and other plant replacement plants shall be the same size as originally specified.

The provisions specified in Section 20-4.07, "Replacement," of the Standard Specifications for the replacement of unsuitable plants shall apply to palm trees. The replacement palm tree for each unsuitable palm tree shall be the same size and species as the palm tree being replaced. Each replacement palm tree shall be planted in the planting hole of the unsuitable palm tree which the new tree is replacing. The method for planting replacement palm trees shall be as specified in this section forpalm trees. Removed unsuitable palm trees 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 palm trees shall be watered as necessary to maintain the trees in a healthy condition. Dead fronds and frond stubs shall be removed from the trunk in a manner that will not injure the tree trunk.

When ordered by the Engineer, one application of a preemergent pesticide conforming to the provisions in "Pesticides" of these special provisions, shall be applied between 40 and 50 working days prior to completion of the plant establishment period.

Palm trees shall be maintained with their vertical axis in a plumb condition. Any leaning or deviation from plumb shall be corrected without damage to the palm tree. Braces that are used to hold palm tree in an upright position shall be removed at least 60 days prior to the acceptance of the contract.

Wye strainers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

10-2.05 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A", of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 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.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be precast portland cement concrete.

Covers for concrete valve boxes shall be glass fiber reinforced plastic.

Valve boxes 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.

BALL VALVES

Ball valves shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Ball valves shall be manufactured from Chlorinated Polyvinyl Chloride (CPVC) or polyvinyl chloride (PVC) and shall conform to the following:

Specification	Minimum Requirement
Non-shock cold water working pressure for 20 mm - 100 mm valves	1623 kPa
Non-shock cold water working pressure for 150 mm valves	1034 kPa
Seats	PTFE (Teflon)
O-Ring Seals	EPDM or Viton

Ball valves shall be of the same size as the pipeline which the valves serve, unless otherwise noted on the plans.

Ball valves shall be installed in a valve box.

GATE VALVES

Gate valves shall be as shown on the plans and in conformance with the provisions in Section 20-2.28, "Gate Valves," of the Standard Specifications and these special provisions.

Gate valves, 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 shall have a solid bronze or brass wedge.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

Irrigation Controllers

Irrigation controllers shall be single, solid-state independent controllers conforming to the following:

A. Irrigation controllers shall be fully automatic and shall operate a complete 14-day or longer irrigation program.
B. A switch or switches shall be provided on the face of the control panel that will turn the irrigation controller "on" or "off" and provide for automatic or manual operation. Manual operation shall allow cycle start at the desired station and shall allow activation of a single station.
C. The watering time of each station shall be displayed on the face of the control panel.
D. The irrigation controller and the low voltage output source shall be protected by fuses or circuit breakers.
E. The irrigation controller mechanism, panel and circuit board shall be connected to the low voltage control and neutral conductors by means of plug and receptacle connectors located in the irrigation controller enclosure.
F. Each station shall have a variable or incremental timing adjustment with a range of 720 minutes to a minimum of one minute.
G. Irrigation controllers shall be capable of a minimum of 4 program schedules.
H. Irrigation controllers shall have an output that can energize a pump start circuit or a remote control valve (master).
I. When 2 or more irrigation controllers operate the same electric remote control valve (master), an isolation relay shall be provided and installed per the controller manufacturer's instructions.
J. Irrigation controllers shall be manufactured by the same company.
K. Where direct burial conductors are to be connected to the terminals strip, the conductors shall be connected with the proper size open-end crimp-on wire terminals. No exposed wire shall extend beyond the crimp of the terminal and the wires shall be parallel on the terminal strip.

Attention is directed to the provisions in "Electric Service (Irrigation)" of these special provisions regarding electrical power for irrigation controllers and irrigation controller enclosure cabinets.

Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

A. Valves shall be glass filled nylon, brass, bronze, or cast iron construction.
B. Glass filled nylon, brass or bronze valves shall be angle pattern (bottom inlet) or straight pattern (side inlet) as shown on the plans.
C. Cast iron valves shall be combination angle pattern (bottom inlet and side inlet) installed as an angle pattern (bottom inlet), as shown on the plans.

Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less.

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.

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.

ARMOR-CLAD CONDUCTORS

Armor-clad conductors shall be used in direct burial applications from pull boxes adjacent to irrigation controller to remote control valves and other irrigation facilities in conformance with the details shown on the plans and these special provisions.

Armor-clad conductors shall conform to the following:

A. Conductors shall be the proper size for the application, and shall be solid, uncoated copper with a conductor size not less than 90 percent of the AWG diameter required.
B. At the Contractor's option, conductor insulation coverings shall be either of the following:

    1. Polyvinyl chloride (PVC) conforming to UL style, Type UF 60°C, 600 V. Average thickness of insulation shall be not less than 1.52 mm, with a minimum thickness of 1.37 mm, or
    2. UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

C. Armor shall be a minimum 0.13-mm thick by 12.7 mm wide Type 304 stainless steel tape that is helically wrapped over each conductor with a 33 percent minimum overlap.
D. Outer jacket for conductors shall be sunlight resistant PVC and shall conform to the Insulated Power Cable Engineer's Association (ICEA) S-61-402, NEMA Standard WC5, and UL Listing 1263. Nominal thickness of the outer jacket shall be 0.76-mm with a minimum thickness of 0.61-mm.

IRRIGATION CONTROLLER ENCLOSURE CABINET

Irrigation controller enclosure cabinets shall be constructed and equipment installed in the cabinets in conformance with the details shown on the plans, the provisions of Section 86-3.04A, "Cabinet Construction," of the Standard Specifications, and these special provisions.

Electric service shall be installed in accordance with "Electric Service (Irrigation)" of these special provisions.

Irrigation controller enclosure cabinets shall be provided with cross ventilation, roof ventilation or a combination of both. The ventilation shall not compromise the weather resistance properties of the irrigation controller enclosure cabinets and shall be fabricated by the manufacturer.

The anchorage arrangement shall be inside the cabinet as shown on the plans. Dimensions of the cabinet shall be suitable for the equipment to be installed as shown on the plans and specified in these special provisions.

Irrigation controller enclosure cabinet dimensions for a single irrigation controller shall be 1219 mm (Height) x 457 mm (Width) x 304 mm (Depth).

Irrigation controller enclosure cabinet dimensions for double irrigation controller shall be 1219 mm (Height) x 609 mm (Width) x 609 mm (Depth).

Irrigation controller enclosure cabinets shall be fabricated in conformance with the provisions in Section 86-3.04A, "Cabinet Construction," of the Standard Specifications.

Irrigation controller enclosure cabinets shall be fabricated of stainless steel .

Irrigation controller enclosure cabinet doors shall not be furnished with integral door locks. Irrigation controller enclosure cabinet door handles shall have provisions for padlocking in the latched position. Padlocks will be furnished by the Engineer. Mounting panels shall be fabricated of metal sheets with a minimum thickness of 1.8 mm for steel or 3 mm for aluminum.

Inside of the doors shall have provisions for storage of the irrigation plans.

Equipment, except for field wiring, shall be installed in the cabinet in a shop prior to field installation.

IRRIGATION SYSTEMS FUNCTIONAL TEST

Functional tests for the irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to, remote control valves.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

PIPE

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) shown on the plans.

Plastic pipe supply lines less than 100 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 marked with a permanently affixed purple warning tape bearing the continuous wording "CAUTION RECYCLED WATER." The tape shall be wrapped around the supply lines in a manner that produces a uniform and smooth fit, free of irregularities.

At the Contractor's option, purple colored polyvinyl chloride (PVC) supply lines may be used for recycled water supply lines in place of standard PVC supply line with affixed purple warning tape. 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.

SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

Flow shutoff device on risers shall automatically and instantly stop the flow of water from a riser when the riser is broken on the downstream side of the device. The flow shutoff device shall be installed as recommended by the manufacturer of the device.

SPRINKLER (TYPE D)

Type D sprinklers shall be factory-installed, pressure-compensating, inline emitters welded to the inner circumference of 15°mm ultraviolet-resistant polyethylene tubing.

Emitters shall pressure compensate by lengthening the emitter’s turbulent flow path. The emitter shall be cylindrical in shape and provide surface area for filtration throughout 360 degrees of its outer circumference. The emitter shall have dual outlet ports, 180 degrees apart.

Emitter spacing and discharge rate shall be as shown on the plans.

Operating pressure range for Type D sprinklers shall be 58 to 413°kPa.

Type D sprinklers shall be installed as shown on the plans and in conformance with the manufacturer's written instructions. Two copies of the written instructions shall be furnished to the Engineer prior to installation.

Type D sprinklers shall be held in place, within the basin and approximately 150 mm below grade, by plastic stakes. Stakes spacing shall be as recommended by the manufacturer of the Type D sprinklers.

SPRINKLER (TYPE C-2 MOD)

Sprinkler (Type C-2 MOD) shall be furnished and installed as shown on the plans, in conformance with these special provisions and as directed by the Engineer.

Drainpipe shall be commercially available, rigid, perforated, polyvinyl chloride (PVC) pipe with holes spaced not more than 150 mm on center on one side of the pipe or black, semi-rigid, plastic mesh tube..

Drain grate shall be a commercially available, one-piece, injection molded drain grate manufactured from structural foam polyolefins, with ultraviolet light inhibitors. Color of drain grate shall be black or green.

Gravel for filling the drainpipe shall have 100 percent passing the 19 mm sieve and 100 percent retained on the 9.5 mm sieve. Gravel shall be clean, washed, dry and free from clay or organic material.

WYE STRAINERS

Wye strainers shall be installed on the upstream side of the electric remote control valves as shown on the plans.

Removable stainless steel strainers for wye strainers shall be 75 µm size mesh.

When garden valves are opened, discharge shall be up and out of the valve box.

FLUSH VALVES

Flush valves shall consist of a 20 mm, ultraviolet resistant, ABS or polypropylene material capable of withstanding a cold water pressure of 413 kPa. Flush valve shall open at 20 kPa and close at 34.5 kPa.

Flush valves shall be installed in valve boxes at the lowest point of each drip emitter irrigation zone or at the ends of dripline tubing for Type D sprinklers as shown on the plans.

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 shall be applied directly to irrigation facilities with smooth surfaces or affixed to aluminum sign plates, which shall be attached to the various above ground irrigation facilities.

Warning sign decals or warning sign decals on aluminum sign plates shall be permanently affixed to backflow preventers, valve boxes, nozzle lines, concrete sprinkler protectors, sprinkler risers, irrigation controller enclosure cabinets, flow sensors, irrigation controller enclosures not in cabinets, gates, fences, and other irrigation facilities in conformance with the details shown on the plans.

Warning sign decals approximately 65 mm x 75 mm shall be permanently affixed to sprinkler risers.

A 100 mm x 100 mm warning sign decal shall be permanently affixed to irrigation controller enclosure cabinet doors, irrigation controller enclosures not in cabinets, backflow preventer assemblies, backflow preventer assembly enclosures, and valve box covers. Decals for valve box covers shall be affixed to aluminum sign plates and the plates affixed to the valve box cover with a silicon base adhesive. 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.

A 300 mm x 300 mm warning sign decal on aluminum sign plate shall be permanently affixed to gates, fences and walls 1.5 m above finished grade. Sign plates for gates and fences shall be attached with "S" hooks and "C" clips or 2.03 mm (14-gage) galvanized steel wire as shown on the plans. Sign plates for concrete walls or other rough surfaces shall be affixed with a silicon base adhesive.

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.

At the Contractor's option, purple colored valves, wye strainers, sprinklers, risers, plastic pipe (irrigation line) and filter assembly units may be used in place of standard irrigation facilities, sprinklers and irrigation line with affixed purple warning tags and decals.

FILTER ASSEMBLY UNIT

A filter assembly unit shall consist of a filter housing, a reusable filter cartridge, a pressure regulator valve, a ball valve, fittings, and pipe, installed in a valve box with wire mesh and gravel or crushed rock, as shown on the plans .

Filter assembly units shall withstand a cold water working pressure of 1034.21 kPa.

Pressure loss through the filter assembly units shall not exceed the following:

FILTER ELEMENT SIZE (mm)	MAX FLOW RATE (liters/min)	MINIMUM INLET PRESSURE (kPa)
63.5 mm Diameter By101.6 mm	151.4	362.67

Filter housings shall be manufactured of reinforced polypropylene plastic.

Filter cartridges shall be reusable stainless steel and shall be capable of 200 size mesh filtration.

Pressure regulator valves must be inline, normally open devices with durable, ultraviolet resistant, plastic bodies with female threaded side inlet and outlet; capable of withstanding a cold water working pressure of 827 kPa, and operated by stainless steel springs.

Pressure regulator valves must have a factory preset outlet pressure 275 kPa, at a flow rate of 7.5 to 56 liters per minute. The preset outlet pressure must be readily identifiable on the outer surface of the valve.

Ball valves in filter assembly units shall be polyvinyl chloride (PVC). The ball seats shall be high molecular weight-high density polyethylene.

AIR RELEASE VALVE

Air release valves shall have plastic bodies capable of withstanding a cold water pressure of 550 kPa, and non-corrosive internal materials.

Air release valves shall seal at 34.5 kPa.

Air release valves shall be installed at the highest point of each drip emitter irrigation zone. Air release valves shall be installed in valve boxes with wire mesh and gravel or crushed rock, fittings, and pipe as shown on the plans.

FINAL IRRIGATION SYSTEM CHECK

A final check of 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 potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to new irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

The following work shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

1. Roadway and Girder Level Eastbound as shown on the plans shall include the following:

    1.1. Install State-furnished 10 m roadway lighting poles.
    1.2. Install utility and lighting panel enclosures on the service platform.
    1.3. Install all conduit, conduit between panels and wireways, pull boxes, junction boxes, wireways, bare copper bonding, anchors, fittings and supports.
    1.4. Install conduits, wiring, and lights for lighting the bike path on Frame 2.
    1.5. Install and terminate cables on Frame 1.
    1.6. Install and terminate cable itemized under "Cost Break-Down" in these special provisions.
    1.7. Install horizontal and vertical struts.
    1.8 Install seismic bracing.
    1.9. Install components and fabricate mounting racks on the service platform.
    1.10. Install copper grounding system.
    1.11. Install Service Pad No. 24.
    1.12. Remove old high mast lights only after new lights are operational (Salvage motors and light fixture only; pole shall become property of the Contractor).
    1.13. Conduct functional testing on all circuits, lighting, and receptacles.

2. Underground and Roadway at Grade as shown on the plans shall include the following:

    2.1. Install conduit and pull boxes for power to overhead signs.
    2.2. Install utility and lighting panel enclosures and receptacles on the service pads.
    2.3. Install all underground conduit duct bank, conduit between panels, manholes, pull boxes, bare copper bonding, anchors, fittings and supports.
    2.4. Install high mast lighting system.
    2.5. Install conduit, boxes, wiring, and lights for the bike path ramp.
    2.6. Install conduit, boxes, wiring and State-furnished bike path landing light poles.
    2.7. Install conduit, boxes, wiring, 6.1 m bikeway light poles and luminaires for lighting the bikeway.
    2.8. Install and terminate cable itemized under "Cost Break-Down" in these special provisions.
    2.9. Install Service Pads No. 25.
    2.10. Install and terminate cables.
    2.11. Install Electric Service (Irrigation).
    2.12 Install copper grounding system.
    2.13. Conduct functional testing on all installed circuits.

3. Removal Electrical as shown on the plans shall include the following:

   3.1. For existing Westbound Structure demolition:

      3.1.1. Remove and salvage TV-943.
      3.1.2. Remove and salvage CMS-64.
      3.1.3. Remove and salvage utility panel.

   3.2. For Eastbound and Westbound Detours:

      3.2.1. Remove and salvage wood poles and lighting fixtures.
      3.2.2. Remove and salvage CMS-65.
      3.2.3. Remove and salvage control cabinet No. 3C.
      3.2.4. Remove and salvage control cabinet No. MD.
      3.2.5. Remove and salvage roadway flashing beacons.
      3.2.6. Remove and salvage existing high mast lighting motors and light fixtures.
      3.2.7. Abandon metal clad cables.
      3.2.8. Abandon conduits.
      3.2.9. Abandon TOS loop detectors.

4. SCADA Remote Terminal Unit System (RTU) as shown on the plans shall include the following:

   4.1. Install SCADA communication and telephone box at Service Platform #23E
   4.2. Install and terminate cable itemized under "Cost Break-Down" in these special provisions.
   4.3. Conduct functional testing on all installed circuits.

5. Call Box System as shown on the plans shall include the following:

   5.1. Install cable itemized under "Cost Break-Down" in these special provisions.
   5.2. Conduct functional testing on all installed circuits.

6. Strong Motion Detection System as shown on the plans shall include the following:

   6.1. Install all conduit, seismic recorder enclosure, anchors, and fittings.
   6.2. Provide assistance to California Geological Survey (CGS) in the installation of the strong motion detection system.
   6.3. Install cable itemized under "Cost Break-Down" in these special provisions and pull cable through the system conduit and cable trays.
   6.4. Conduct continuity test on all circuits.

7. Traffic Operation System (TOS) as shown on the plans shall include the following:

   7.1. Install and test all camera stations, including all associated cables.
   7.2. Install State-furnished-Model 500 Changeable Message Sign system (CMS).
   7.3. Install and test preformed detector and inductive loops including associated cable and junction boxes.
   7.4. Install and test all fiber optic system including fiber optic splice cabinets, fiber optic cables, splice closures, fiber optic data modems and fiber optic transceivers.

10-3.02 ABBREVIATIONS

The following abbreviations are added to those listed in Section 1-3.01, "Abbreviations," of the Standard Specifications:

BNC	Bayonet Nut Connector
EEMAC	Electrical Equipment Manufactures Advisory Council
EMI/RFI	Electromagnetic Interference/Radio Frequency Interference
EPR	Ethylene propylene rubber
FCC	Federal Communications Commission
GFCI	Ground Fault Current Interrupter
IDC	Insulation Displacement Connector
ICEA	Insulated Cable Engineering Association
IEC	International Electrotechnical Commission
I/O	Input / Output
ISDN	Integrated Services Digital Network
NEC	National Electrical Code
NETA	International Electrical Testing Association Inc.
NC	Normally Closed
NTSC	National Television Systems Committee
RUS	Rural Utilities Service
SCADA	Supervisory Control And Data Acquisition
TIA	Telecommunications Industry Association

10-3.03 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost breakdown shall be divided into the following categories. Within each category, each item of work shall be broken down, at a minimum, to include the following listed items in addition to those listed in the Standard Specifications:

1. Roadway and Girder Level Eastbound electrical installation is shown on the plans, and shall include the following additional items of the cost break-down:

    1.1. Termination and splice - list each size and type.
    1.2. Conduits, conduit anchors, fittings and supports – list each size and type.
    1.3. Wireways on service platforms – list size and type.
    1.4. Lifting devices – list size and type.
    1,5. Receptacles – list size and type.
    1.6. Utility and lighting panels – list size and type.
    1.7. Utility and lighting transformers list size and type.
    1.8. Electrical hardware – list size and type.
    1.9. Mounting rack – list components and fabrication method.
    1.10. Grounding system – list size and type.
    1.11. Embed strut channel – list size and type.

2. Underground and Roadway at Grade electrical installation is shown on the plans, and shall include the following additional items of the cost break-down:

    2.1. Termination and splice - list each size and type.
    2.2. Conduits, conduit anchors, fittings and supports – list each size and type.
    2.3. High Mast lighting system – list size and type
    2.4. Lifting devices – list size and type.
    2.5. Utility and lighting panels for service pad – list size and type.
    2.6. Utility and lighting transformers list size and type.
    2.7. Electrical hardware – list size and type.
    2.8. Duct bank – list size and type.
    2.9. Manholes – list size and type.
    2.10. Grounding system – list size and type.

3. Removal Electrical is shown on the plans.

4. SCADA Remote Terminal Unit System installation is shown on the plans, and shall include, the following additional items of the cost break-down:

    4.1. Telephone terminal box – list size and type.
    4.2. SCADA communication terminal box – list size and type.
    4.3. Equipment required for functional testing – list size and type.
    4.4. Termination and splice - list each size and type.
    4.5. Cable – list each size and type.

5. Call Box System installation details are shown on plans, and shall include the following additional items of the cost break-down:

    5.1. Cable – list each size and type.
    5.2. Termination and splice - list each size and type.

6. Strong Motion Detection System is shown on plans, and shall include, but not be limited to the following additional items of the cost break-down:

    6.1. Recorder cabinet – list size and type.
    6.2. Termination and splice - list each size and type.

7. Traffic Operations System is shown on the plans, and shall include, but not be limited to the following additional items of the cost break-down:

    7.1. Camera controller unit and Video encoder unit – list size and type.
    7.2. Integrated camera unit – list size and type.
    7.3. Preformed loops – list type.
    7.4. Fiber distribution units – list size and type.
    7.5. Fiber splice closure equipment– list size and type.
    7.6. Fiber optic data modems and fiber optic transmitters and receivers – list size and type.

10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Comply with Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications.

Before commencing the work, the Contractor shall submit in writing to the Engineer a description and detailed schedule of the intended operations relative to keeping the existing Mole Substation in continuous operation and keeping the existing bridge and roadway lighting and existing and temporary traffic operation system operational. Such schedule shall be part of the progress schedule.

Regardless of construction procedure, methods and equipment selected, the Contractor shall have all materials and equipment on the site for the installation of the electrical system. Disconnection of any existing or temporary power will not be permitted until the new equipment has been tested and properly adjusted.

Full compensation for temporary facilities shall be considered as included in the contract lump sum prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

10-3.05 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place, and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor shall obtain written approval from the Engineer, at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

1. for a duration of up to 15 days on any continuous segment of the freeway/highway longer than 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-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

10-3.06 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS

GENERAL

Summary

This work includes constructing cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards.

Comply with Section 86-2.03, "Foundations," of the Standard Specifications, and "Piling," of these special provisions.

MATERIALS

Concrete must contain not less than 400 kilograms of cementitious material per cubic meter, or as specified in "Piling," and "Corrosion Control For Portland Cement Concrete," of these special provisions, whichever is greater.

CONSTRUCTION

For standards located in sidewalk areas, the pile foundation must be:

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 100 mm

PAYMENT

Payment for cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 86-8, "Payment," of the Standard Specifications and these special provisions.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the cast-in-drilled-hole pile foundations for the traffic signal and high mast lighting assemblies, including drilling holes, disposing of the material resulting from drilling holes, temporarily casing holes and removing water when necessary, placing anchor bolt assemblies, furnishing and placing concrete and reinforcement, furnishing 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 redrilling through concrete, shall be considered as included in the contract lump sum price paid for underground and roadway at grade, and no additional compensation will be allowed therefor.

10-3.07 CONSTRUCTION CONTRACT INTERFACE RESPONSIBILITY

Interface Points:

1. Hinge EE Interface Skyway and Oakland Approach Structures:

    1.1. Frame 1 Westbound: The Contractor shall splice fiber optic cable into cabinet TOS 23WS.
    1.2. Frame 2 Eastbound: The Contractor shall extend conduit, pipe sleeves, and supports from Frame 1 Eastbound into Frame 2 Eastbound, as well as all of the materials required for splicing and termination of cables.
    1.3. 15 kV Splice Tray: The Contractor shall install and splice 15 kV cable into 15 kV splice tray.

2. Pier 15E Interface Skyway and Oakland Approach Structures:

    2.1. Existing Service Platform No. 21E:

        2.1.1. The Contractor shall install and terminate telephone cable into existing telephone terminal box TEL 21E.
        2.1.2. The Contractor shall install and terminate SCADA cable into communication cabinet TEL 21E.
        2.1.3. The Contractor shall install fiber optic cable into cabinet TOS 23WS.

    2.2. 15 kV Substation: The Contractor shall terminate the 15 kV cable at the switchgear.
    2.3. The Contractor shall route and coil the BASE fiber at Platform 19E.

Locations of battery limits are shown on the plan sheets. The Contractor shall provide all materials required for splicing and termination of cables.

All power, control and communication splices and terminations shall be made by the Contractor. The Contractor shall provide the splice kits and terminate all connections. The Contractor shall perform complete cable test on all circuits that cross the control interface point.

The Contractor shall perform the final acceptance tests of each termination and splice in accordance with latest applicable ICEA, International Electrical Testing Association Inc. (NETA) and IEEE standards.

The tests for the fiber optic cable shall include continuity, backscattering, attenuation and loss measurements for each splice performed.

The tests for the MV cables shall include DC High Potential Tests, continuity, and insulation resistance tests, as applicable, for each splice performed.

10-3.08 CONDUIT

Conduit to be installed underground shall be Type 1 or Type 3 unless otherwise specified. All conduit installed on the bridge shall be Type 2 unless otherwise specified. Conduit within the box girders and detector termination conduit shall be Type 1. All conduit installed in the barrier strip that are embedded into concrete shall be Type 1 or Type 2. Any conduit in the barrier strip that is not fully embedded in concrete or located exposed shall be Type 2.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 1.

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 a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications, or a concrete-tight split coupling, or concrete-tight set screw coupling shall be used.

Pull ropes for use when installing cables in conduit shall consist of flat, woven, lubricated, soft-fiber polyester tape with a minimum tensile strength of 8000 N and shall have printed sequential measurement markings at least every meter.

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.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

RIGID GALVANIZED STEEL CONDUIT, THREADED COUPLINGS AND ELBOWS

The rigid galvanized steel (RGS) conduit, threaded couplings, and elbows shall conform to Section 86-2.05, "Conduit," of the Standard Specifications for Type 1 where shown on the plans.

POLYVINYL CHLORIDE COATED RIGID GALVANIZED STEEL CONDUIT, THREADED COUPLINGS, AND ELBOWS

The polyvinyl chloride (PVC) coated rigid galvanized steel (RGS) conduit, threaded couplings, and elbows shall conform to Section 86-2.05, "Conduit," of the Standard Specifications for Type 2 where shown on the plans.

POLYVINYL CHLORIDE COATED RIGID GALVANIZED STEEL CONDUIT BODIES

The polyvinyl chloride (PVC) coated rigid galvanized steel (RGS) conduit bodies shall conform to the following requirements before the PVC coating is applied:

1. The PVC-coated RGS conduit bodies shall conform to Federal Specification W-C-586D, and UL Standard No. 514B. The PVC-coated RGS conduit bodies zinc surfaces shall remain intact and undistributed on both the inside and outside throughout the preparation and application processing.
2. The PVC-coated RGS conduit bodies shall be "Hot-Dipped" galvanized inside and out after fabrication with "Hot-Dipped" galvanized threads. The zinc coating for PVC-coated RGS conduit bodies will be tested in accordance with ASTM Designation: A239.
3. The "Hot-Dipped" galvanized threads, the exterior, and the interior for the PVC-coated RGS conduit bodies shall have a urethane coated of a nominal thickness of 50 microns.
4. The PVC-coated RGS conduit bodies shall conform to the following requirements when the PVC coating is applied:

    4.1. All PVC-coated RGS conduit bodies shall conform to NEMA Standard No. RN-1.
    4.2. The bond between the coatings and the metal shall be greater than the tensile strength of the coatings.
    4.3. All PVC-coated RGS conduit bodies shall have an exterior PVC coating of a minimum thickness of 1 mm applied by dipping in liquid plastisol.
    4.4. All Hubs on PVC-coated RGS conduit bodies shall have a PVC sleeve extending one pipe diameter or 53 mm whichever is less. The inside diameter (I.D.) of the sleeve to be equal to the outside diameter (O.D.) of the uncoated pipe.
    4.5. Stainless steel encapsulated screws shall be supplied with all form 7 and form 8 PVC-coated RGS conduit bodies.
    4.6. The PVC coating on all form 8 PVC-coated RGS conduit bodies shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering the top of the conduit body around the opening.
    4.7. The PVC coating on all form 8 conduit body covers shall form a gasket-like flange of at least 8 mm wide and 1 mm thick covering at the bottom of the cover and mating with the flange of the conduit body.
    4.8. All PVC-coated RGS conduit bodies for conduits less than 103 mm shall be form 7 conduit bodies.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT

The liquid tight flexible metallic conduit shall conform to the following requirements:

1. The flexible metal shall be constructed of continuously interlocked strip and shall be coated with sunlight resistant PVC jacket.
2. The metal core shall be hot-dipped galvanized steel core with a heavy coating of zinc.
3. The jacket shall be resistant to weather, temperature, oil and chemical breakdown.
4. Conform to the provisions of NEC Article 351 under "Liquid-tight Flexible Metal Conduit".
5. UL listed for Safety 360.

10-3.09 UNDERGROUND RACEWAYS

DUCT BANKS

Underground conduits shall be Type 1 encased in concrete. Concrete for conduit encasement shall be 907 kg test with aggregate of 20 mm or smaller.

The concrete shall be colored red by the addition of 6 kg of red oxide powder to each cubic meter of mix. The coloring shall be thoroughly mixed into the concrete before pouring. Adequate spacers, tie-downs and bracing shall be provided to maintain conduits in place during the pouring of the concrete. Ducts shall be installed so as to drain to manholes. When installed conduit ducts are lower than the conduits in the manhole, provide conduit drain hole.

All conduits entering and leaving the manholes and pull boxes shall be bonded together with copper bare conductor with ground clamp connected to system ground. All conduit connections shall be threaded. All approved connections shall be made with suitable conductivity enhancing thread compound. After installation all conduits shall be checked for continuity and cleaned properly. Cleaning of conduit shall be done by the use of compressed air for sizes 41 mm and smaller, and by the use of mandrel and cleaning brushes pulled through each conduit for sizes larger than 41 mm. Prior to backfilling of the underground duct system, the Contractor shall provide a yellow (with black lettering) warning tape, 340 mm from the finished grade, stating "CAUTION-BURIED ELECTRICAL LINE".

MANHOLES

All manholes shall be installed by the Contractor as shown on the plans.

MANHOLE FRAMES AND COVERS

Frame and cover shall be cast iron and shall be designated for H-20 Traffic loading, and shall comply with ASTM F1143.

Manhole cover shall be engraved with the following nameplates: Caltrans High Voltage, Caltrans 600 V, Caltrans Low Voltage TOS&COM, with manhole number as shown on the plans.

10-3.10 SUPPORT HARDWARE FOR CONDUITS, CABLE TRAYS, AND WIREWAYS

STAINLESS STEEL POWER-STUD ANCHOR-THREADED VERSION

Stainless steel power-stud, anchor-threaded version shall have a one-piece anchor body with the length identification code. The anchor bodies shall be manufactured from Type 316 stainless steel and shall have an expansion mechanism, which consists of a pair of interlocking independent wedges.

Anchors that have less than a 40 mm hole depth can be installed anywhere in the box. If the anchor will require a hole depth of greater than 40 mm, the Engineer will consult with the Structural Engineer of Record prior to approving the location and depth of the anchor. Due to the high compressive strength of the concrete in the superstructure, it may be difficult to drill.

Anchor Component	Component Material
Anchor Body	Type 316L Stainless Steel
Nut	Type 316L Stainless Steel
Washer	Type 316L Stainless Steel
Expansion Wedge	Type 316L Stainless Steel

EMBED STRUT CHANNEL

Embed strut channels, as shown on the plans, shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and these special provisions.

Embed strut channels cast in preformed concrete shall be installed at the time of casting and not after. Embed struts shall be manufactured from 12-gage hot-dip galvanized rolled steel. Load ratings shall have a safety factor of 3. An electro-galvanizing and dichromate finishing process shall be applied after fabrication to achieve a 13 µm electro-galvanizing plating. The channels shall be of a standard size to accommodate standard channel fittings and nuts.

MOUNTING RACKS

Mounting racks shall be constructed from 12-gage steel channel. The steel shall be fabricated by a formed hot-dip galvanized rolled steel method and have a 13 µm electro-galvanizing plating applied after fabrication. All fittings and hardware used for construction of the mounting racks shall be of steel with the same electro-galvanizing plating.

THREADED BOLT SLEEVES AND BOLTS

Threaded bolt sleeves required for the navigation light mounting plate shall conform to the requirements in ASTM Designation: A 36 and installed by the concrete fabricator. The bolts shall conform to the requirements in ASTM Designation: A 37.

ELECTRICAL HARDWARE

All electrical hardware, including but not limited to, bolts, nuts, washers, lock washers, fastening screws, expansion anchors, U-bolts and hold-down clamps shall be Type 316L stainless steel unless otherwise noted.

CONDUIT AND TRAY SUPPORTS

Conduit and tray support brackets, as shown on the plans, shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications and these special provisions.

The anchoring and supports of trays shown on the plans are designed to Seismic Zone 4 requirements. The Contractor shall determine the construction methods for Seismic Zone 4 for conduit supports at each support location, including location and length of support channel. Once determined, the Contractor shall submit to the Engineer for review and approval at least 30 working days prior to ordering or fabrication of conduit supports.

The Engineer will consult with the Structural Engineer of Record prior to approving concrete anchors requiring a depth of greater than 40 mm. Support channels must be embedded in the pre-fabricated concrete girder sections, during manufacture, for all trays and all major conduit runs. The following tray and conduit weight tables shall be used by the Contractor for determining the spacing of supports. The tables show the maximum probable mass of insulated copper conductors assuming maximum tray and conduit fill.

Conduit size in mm:	41	53	63	78	103
Mass in kg/m:	6.15	9	12.9	18.75	28.5

Tray size in mm:	305	610	762
Mass in kg/m:	37.5	75	93.75

Maximum tray support span shall be 4.74 meters.

Conduits shall be supported as shown on the plan otherwise, maximum conduit support span shall be 3.0 meters.

NEMA TYPE 4X WIREWAY

The wireway shall be NEMA Type 4X Continuous Hinge Feed-Through Wireway. It shall be 14-gage Type 304 stainless steel. The seams shall be continuously welded and ground smooth, no holes or knockouts. It shall have 10-gage stainless steel flanges with smooth, rounded edges on all sections and fittings preventing damage to the insulation of the wire. The stainless steel heavy butt hinges and door clamp assembly shall assure a complete seal between covers and bodies. The gasket and adhesive shall be oil-resistant. The solid oil-resistant gasket shall be positioned between flanges when sections and fittings are bolted together. The wireway shall meet the latest edition of the following industry standards NEMA Type 4X Enclosure, UL 870 and have a 2B finish. The physical size and dimensions shall be as shown on the plans. The wireway shall be manufactured by B-Line Systems, Chalfant, Hoffman or other approved manufacturer.

CABLE TRAY SOLID TROUGH TYPE

The solid trough type tray shall be the same as ladder type cable tray specified in these special provisions except for the following. It shall be a solid bottom trough type tray with two longitudinal members (side rails) with a corrugated bottom welded to the side rails. The peaks of the corrugated bottom shall have a minimum flat cable-bearing surface of 70 mm and shall be spaced on 152-mm centers. The cable trays may be manufactured by B-Line Systems, Chalfant, or other approved manufacturer. Solid bottom trays with covers shall be used for communications and signal wire trays. Tray fittings shall include all reducers, and vertical and horizontal bends. Cable tray shall be supported at intervals of not more than 4.74 m. All conduits terminating at trays shall provide a continuous cable route by using bushings specifically suited for attaching conduit to the tray rail and for providing ground continuity.

CABLE INSTALLATION IN CABLE TRAY

All cable installed in cable trays shall be dressed neatly, arranged in bundles by function and strapped to the cable tray at intervals no less than 600 mm using plastic ties.

10-3.11 PULL BOXES, SPLICE BOXES AND JUNCTION BOXES

Grout shall not be placed in the bottom of pull boxes.

BARRIER PULL BOXES

Type 9 and 9A barrier pull boxes shall be as shown on the plans and detailed on Standard Plans ES-9D, except the pull box shall have captive stainless steel cover screws.

NEMA TYPE 4X STAINLESS STEEL PULL BOXES

The body and the cover plate of the NEMA Type 4X enclosure shall be made of 14-gage Type 304 or Type 316 stainless steel. The seams shall be continuously welded and ground smooth, no holes or knockouts. It shall have a seamless foam-in-place gasket that assures watertight and dust-tight seal. The gasket and adhesive shall be oil-resistant. All exterior hardware shall be Type 304 or Type 316 stainless steel.

The enclosure shall meet the latest edition of the following industry standards NEMA Type 4X Enclosure, UL870.

The box engraving, physical size and dimensions shall be as shown on the plans. The enclosure shall be manufactured by B-Line Systems, Chalfant, Hoffman or other approved manufacturer.

NEMA TYPE 12 PULL BOXES SINGLE DOOR

The NEMA Type 12 single door pull box shall conform to the following:

Construction

1. Enclosure bodies are either 14-gage or 16-gage steel. All doors are 14-gage steel.
2. Seams shall be continuously welded and ground smooth, no holes or knockouts.
3. Continuous hinge.
4. External screw door clamps are quick and easy to operate.
5. Door shall be removed by pulling heavy gage continuous hinge pin.
6. Oil-resistant gasket attached with oil-resistant adhesive and held in place with steel retaining strips shall be provided.
7. The box engraving, physical size and dimensions shall be as shown on the plans drawings.
8. Finish shall be white inside with ANSI 61 gray outside finish over phosphatized surfaces. Optional panels shall be white.

Industry Standards

1. UL 508 Type 12.
2. NEMA/EEMAC Type 12.
3. ANSI/IEC/NEMA 60529, IP-65.

NEMA TYPE 4X ENCLOSURES STAINLESS STEEL

The door shall be removed by pulling a stainless steel continuous hinge pin. The enclosure shall meet the latest edition of the following industry standards NEMA Type 4X Enclosure, UL508, and have a 2B finish.

The enclosure engraving, physical size and dimensions shall be as shown on the plans. The enclosure shall be manufactured by B-Line Systems, Chalfant, Hoffman or other approved manufacturer.

Proper air circulation in the cabinets shall be provided to protect the PLC equipment. Isolated ground bus to connect instrumentation shields including a ground lug for equipment ground shall be provided.

The NEMA Type 4X steel enclosures shall be single door and shall be provided with the following:

1. Enclosure bodies and doors are 14-gage Type 304 or Type 316 stainless steel.
2. Seams continuously welded and ground smooth, no holes or knockouts.
3. It shall have a seamless foam-in-place gasket that assures watertight and dust-tight seal.
4. External mounting feet or wall mounted.
5. Door and body stiffeners in larger enclosure.
6. Rolled lip around three sides of door and all sides of enclosure opening excludes liquids and contaminants.
7. Door clamps are quick and easy to operate.
8. Door removed by pulling heavy gage continuous hinge pin.
9. Hasp and staple for padlocking.
10. Data pocket is high-impact thermoplastic.
11. Oil-resistant gasket attached with oil-resistant adhesive and held in place with steel retaining strips.
12. Collar studs provided for mounting panels.
13. The box engraving, physical size and dimensions shall be as shown on the plans.
14. Proper air circulation in the cabinets
15. Isolated ground bus to connect instrumentation shields, and a ground lug for equipment ground.

Finish

White inside with ANSI 61 gray outside finish over phosphates surfaces. Optional panels are white.

Industry Standards

1. UL 508 Type 12.
2. NEMA/EEMAC Type 12.
3. ANSI/IEC/NEMA 60529, IP-65.

SCADA and Telephone Termination Enclosure

The cabinets shall include terminations for 50 twisted pair communications leads. Noise suppression resistors with a 1-percent tolerance shall be provided for each pair.

15 kV SPLICE TRAY

The high voltage splice tray shall be installed according to the latest version of NEMA VE2 The tray shall be made of AISI Type (304) stainless steel. Each cover shall be secured with at least ten stainless steel bolts. Hardware shall be AISI Type 316 stainless steel. Markings for high voltage splice box shall read "High Voltage" and be permanently marked and readily visible seams shall be continuously welded and ground smooth.

10-3.12 CONDUCTORS, CABLES AND WIRING

Splices shall be insulated by electrical insulating coating.

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire 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. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2 AWG, inclusive.

600 VOLT SINGLE CONDUCTOR CABLE

All 600-volt single conductor cable shall be the following unless otherwise noted on the plans. The cables shall be insulated with a EPR–insulation rated for 600 volts. The cables shall be UL listed as Type RHH, RHW-2, or USE-2, VW-1 600 V. All cables No. 1/0 and larger shall be UL Type TC rated.

The conductor shall be soft annealed uncoated copper Class B stranded per ASTM B-8. The EPR insulation shall meet the requirements of ICEA S-95-658 / NEMA WC70 and UL Standards 44 and 854. The composite insulation thickness shall be as follows:

Conductor Size	EPR Thickness
No. 14 - No. 10	1.14 mm
No. 8	1.52 mm
No. 6 - No. 2	1.91 mm
No. 1 - No. 4/0	2.54 mm
250 kcmil – 500 kcmil	3.30 mm

The cable surface shall be printed in a contrasting color with the following information:

1. Manufacturers' name.
2. Plant number.
3. Conductor size.
4. Cable type.
5. Voltage rating.

The cable shall be manufactured by The Okonite Company, General Cable, Prysmian, or equal. Manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with ICEA S-95-658 / NEMA WC70 and UL 44.

600 VOLT MULTI-CONDUCTOR CABLE

All 600 volt rated multi-conductor cables shall be the following unless otherwise noted on the plans drawings. The cables shall be insulated EPR, assembled as a multi-conductor cable with flame resistant fillers and binder tape with an overall PVC jacket. The cables shall be capable of operating continuously in both wet and dry locations at conductor temperature of 90 °C for normal operation, 130 °C for emergency overload rating, and 250 °C short circuit rating.

The conductors shall be soft annealed uncoated copper Class B stranded in conformance to the requirements in ASTM Designations: B 8. The single conductors shall be ethylene propylene rubber insulated meeting the requirements of UL 1581 and ICEA S-95-658 / NEMA WC70. Color coding for sizes No. 10, 12, 14 and 16 AWG shall conform to the requirements in ICEA Method I Table K-2. Sizes No. 8 and larger shall be numerically coded using ICEA Method 4. The insulation thickness shall be as follows:

Conductor Size	EPR Thickness
No. 16	0.64 mm
No. 14 - No. 10	0.76 mm
No. 8 - No. 2	1.14 mm
No. 1/0 - No. 4/0	1.39 mm

The insulated conductors (and grounding conductor if required) shall be cabled together with flame resistant fillers and binder tape. The jacket shall be extruded PVC meeting the physical and dimensional requirements of ICEA S-95-658 / NEMA WC 70. The cable shall pass the vertical tray flame test requirements of IEEE 383 and 1202 and UL 1277. The cable shall be UL listed as Type TC.

The cable surface shall be printed in a contrasting color with the following information:

1. Manufacturers' name.
2. Plant number.
3. Number of conductors.
4. Conductor size.
5. Cable type.
6. Voltage rating.

The cable shall be manufactured by The Okonite Company, General Cable, Prysmian, or equal. The manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with ICEA S-95-658 / NEMA WC 70.

SHIELDED TWISTED PAIR AND TRIAD CABLES

All shielded twisted pair No. 18 (0.832 mm^2) multi-conductor communication cables (fifty pairs, six pairs and two pairs) and twisted triad shall be stranded annealed copper (per ASTM Designations: B 3 and ASTM B 8). The insulated single conductors shall be twisted into pairs, triads or multiple conductor components. The insulation shall be flame-retardant cross-linked polyethylene with color code in conformance with the requirements in ICEA Method 1. The insulation shall be 0.76 mm nominal.

The cable components are cabled with non-hygroscopic fillers, as necessary, and an overall binder tape. The individual pairs or triads shall be shielded with a 0.19 mm Aluminum/polymer tape with tinned copper drain wire applied helically over the pairs or triads. The overall shield shall be a 0.19 mm Aluminum/polymer tape with tinned copper drain wire applied helically over the cable core.

The overall jacket shall be 2.8 mm flame-retardant and sunlight resistant polyvinyl chloride (PVC). A nylon ripcord shall be applied longitudinally under the overall jacket to facilitate jacket removal.

The cable shall be suitable for Cable Tray use and have the following ratings and listings:

1. UL Type TC - 600 volt.
2. UL Class XL.
3. UL Subject 13 and 1277.
4. IEEE 383 and 1202.

E. ICEA S-95-658 / NEMA WC70 - 600 volt.

The cable shall be manufactured by Belden Cable, The Okonite Company, General Cable, Prysmian, or equal. The manufacturer shall furnish a notarized certificate of compliance to demonstrate cable furnished is in compliance with UL 44.

Communication Cable Splices

Splices shall be done only as approved by the Engineer. Splices for shielded No. 18 multi-conductor, twisted pair cables shall be as recommended by the cable manufacturer and suitable for the environment that the splice is located. The Contractor shall submit the cable manufacturer's recommended splicing method to the Engineer for approval prior to using the method. The Engineer shall approve splice locations. The splicing kits shall be manufactured by Raychem, 3M or other approved manufacturer.

15 kV CABLE

The 15 kV shielded single conductor power cable shall be 15 kV, 133 percent insulation rated power cable designed to operate at conductor temperatures of 105 °C normal, 140 °C emergency, and 250 °C short circuit conditions as defined by ICEA S-93-639 (NEMA WC-78) and (UL) Standard 1072. The cable shall be suitable for installations above or below grade, indoors or outdoors, and in wet or dry locations. The qualifying cable shall be (UL) labeled as MV-105, Sunlight Resistant and for cable tray use in accordance with UL Standard 1072.

Conductors

The conductors shall be compressed, Class B stranded copper. The copper conductors shall consist of all bare strands or tin-coated strands in the outer layer. Conductors shall be unbroken for the full length of the reels specified in the Purchase Order. Reels containing splices will be rejected.

Conductor Shield

The conductor shielding shall consist of an extruded, black-colored, nonmetallic semiconducting or non-conducting energy suppression thermosetting compound material The minimum average thickness shall be 0.5 mm.

Insulation

The insulation shall be a discharge resistant, ethylene propylene (EP) based compound and be listed by Underwriters Laboratories. The minimum average thickness of the insulation shall be 5.59 mm. The manufacturer shall perform the Insulation Corona Discharge Resistance Test of ICEA S-93639 tested in conformance with the requirements in ASTM Designation: D 2275, "Standard Test Method for Voltage Endurance of Solid Electrical insulating materials Subjected to Partial Discharges (Corona) on the Surface," and submit the results to the Engineer before acceptance of the cable.

Insulation Shielding

The insulation shielding shall consist of a nonmetallic semiconducting EPR material extruded directly over the insulation and a 0.12-mm bare copper tape. The nonmetallic semi conducting layer shall be black-colored. The layer shall be free stripping from the EP insulation.

Metallic Shield

The metallic shield shall be coated copper tape, helically applied with a minimum overlap of 12.5 percent, directly over the nonmetallic layer.

Overall Jacket

-The overall jacket shall be extruded black-colored Polyvinyl Chloride (PVC) material and shall be surface printed as required by UL Standard 1072.

Production Testing

Production testing shall consist of the following:

1. Continuous DC Spark testing of the non-conducting conductor shield.
2. AC Voltage Withstand test for a 5-minute duration, of each finished cable at 44 kV.
3. Volume Resistivity of the insulation shield.
4. DC Resistance of all insulated conductors.
5. Dimensional Verification of all extruded layers.
6. Absence of water in conductors and interfaces confirmed.

Cable Accessories

The manufacturer of the splices and terminations shall have a minimum of 15 years specialized in manufacturing of heat shrinkable cable accessories. The manufacturer of the splices and terminations shall be the Raychem Corporation, 3M, Elastimold or approved equal.

The cable splicer shall have a minimum of five years experience and be certified by the splice and cable termination manufacturer. The splicer shall provide a resume documenting his experience and qualifications to be approved on this project by the Resident Engineer.

Cable Terminations

The termination shall be IEEE 48, Class 1, heat-shrinkable cable terminations in kit form, capable of properly terminating cables specified in this section. Terminations for single-conductor cables shall consist of heat-shrinkable radiation crosslinked high dielectric constant linear stress relief material and heat-shrinkable radiation crosslinked non-tracking outer insulation. Terminations shall contain high relative permittivity electric stress relief mastic for insulation shield cutback treatment and a heat-activated sealant for environmental sealing.

In addition to the components described above, the conductor kits shall contain heat-shrinkable components to seal the cable jacket, the phase conductor, ground wire and re-jacket phase and ground conductors.

Cable Splices

Splices of high voltage cable shall be avoided if possible. Where necessary, because of constructability reasons, splice locations shall be approved by the Engineer. In general, splices of high voltage cables shall be scheduled so that the length of cable between splices is approximately 400 meters. All 15 kV splices shall be installed as shown on the plan sheets. A splice shall be scheduled at the construction boundaries. Where possible, longer cable runs are encouraged. The Splices, where necessary, shall be IEEE 404, heat shrinkable cable splices in kit form, capable of properly splicing cables specified in this section. Splice kits shall contain all necessary components to reinstate primary cable insulation, metallic shielding and grounding systems and overall jacket to the equivalent of the cable itself. Splices shall be of a uniform cross-section and shall consist of heat-shrinkable radiation crosslinked insulation. The outer insulating layer shall be bonded to a conducting layer for shielding. The splice shall be re-jacketed with a heavy-wall, heat-shrinkable sealant lined sleeve to provide a waterproof hot melt adhesive seal. Splices shall contain heat-shrinkable radiation cross-linked high dielectric constant linear stress relief material. Splices shall contain a high relative permittivity electric stress relief mastic for insulation shield cutback treatment and a heat-activated sealant for environmental sealing. Kits shall allow splicing cables with different types of insulation, conductor sizes, and shielding construction. Kits shall accommodate commercially available standard connectors.

Cable End Sealing Caps

The end seal caps shall be heat-shrinkable crosslinked polymeric end sealing caps capable of sealing cables specified in this section. End caps shall be pre-coated with a heat activated sealant.

DC High Potential Test

Perform DC high potential test of each conductor in accordance with NEMA WC 5. Contractor shall furnish a report for the engineers' approval documenting the test results.

Cable Pulling

The Contractor shall pull conductors by hand, or by mechanical aids, such as winches or other power actuated pulling equipment, if permitted. Prior to installation of conductors by mechanical aids, the Contractor shall test the conductors in accordance with Section 10-3.09, "Conductors, Cables, and Wiring," of the special provisions. The Contractor shall submit the manufacturer's recommended procedures for pulling the conductors to the Engineer for review and approval at least 20 days prior to installing the conductors.

If a mechanical aid is allowed then a tension measuring devise or breaking swivel shall be placed between the end of the conductor grip and pull rope to ensure that the tension does not exceed 100 percent of recommended tension. The mechanical aid shall have a ball bearing swivel to prevent the conductors from twisting during installation.

Closed Circuit Television Cable

Comply with the requirement in "Hybrid Camera Cable and Connectors," of these special provisions.

10-3.13 SEISMIC ANCHORING

All equipment including fixtures and raceways shall be mounted and braced to withstand, without damage, seismic acceleration forces in both horizontal and vertical directions of 0.33 g, for installation in Seismic Zone 4, in accordance with the Uniform Building Code (UBC), Section 2312. The anchoring methods are to be submitted for review by the Engineer. The installation shall meet requirements of the Essential Services Building Seismic Safety Act, Senate Bill 230, Title 24.

10-3.14 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 hand holes 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 hand holes 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 only combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. 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.

10-3.15 STRUCTURE GROUNDING

Install a 500 kcmil bare copper main grounding conductor per plan sheets in the girder from Pier E20R to Pier E22R and exothermically weld the conductor to the two 500 kcmil grounding conductors installed by others at Pier E20R and Pier E22R. The two 250 kcmil bare grounding conductors installed by others in all piers shall be exothermically welded to the 500 kcmil main grounding conductor in the girder. A 4/0 bare copper grounding conductor shall be exothermically welded to the 500 kcmil bare copper grounding conductor and extended per plan sheets to the 600 volt power distribution system, TOS/COM vaults, and to Service Platform 23E. All bridge electrical components shall be grounded to this system as shown on the plans.

Exothermically weld 250 kcmil bare grounding conductor to 500 kcmil grounding conductor in MH-10 and rout into MH-44 all the way to MH-56, passing thru and exothermically welding to 250 kcmil bare copper conductor pigtails at Service Pads No. 24 and 25.

Install a 4/0 bare copper grounding conductor per plan sheets from MH-6 to Service Pad No. 26 and exothermically weld the conductor to the 4/0 grounding conductor installed by others in MH-6.

Grounding conductors shall be stranded soft drawn bare copper meeting the requirements of the ASTM Specifications.

The regulatory requirements which govern the work of this Section include the following governing Codes and Standards:

1. American Society for Testing and Materials (ASTM):

    1.1. ASTM Designation: B-3, Soft or Annealed Copper Wire.
    1.2. ASTM Designation: B-8, Concentric-Lay Stranded Copper Conductors.
    1.3. ASTM Designation: B-33, Tinned Soft or Annealed Copper Wire for Electrical Purposes.

2. Federal Specification QQ-W-343, latest revision, Wire, Electrical, Copper, Uninsulated.

10-3.16 SERVICE

Continuous welding of exterior seams in service equipment enclosures is not required.

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.

Circuits with Model 500 changeable message signs shall have service equipment enclosures which have main busses and terminal lugs rated for 100 A, minimum, and a No. 2 bare copper ground wire.

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.

Irrigation Controller (IC) TD1, TD2, TD3, and TD4: Electric service (irrigation) shall be single-phase service from Mole Substation and not metered.

10-3.17 ELECTRICAL EQUIPMENT IDENTIFICATION AND LABELING

General

The Contractor shall furnish materials and labor as required for the complete identification and labeling of existing and new conduits, trays and electrical equipment as shown on the accompanying drawings, circuit and conduit schedules. The Contractor shall provide labeling materials and labor as required to completely label components of all electrical systems, whether specifically called for or not and whether provided by the Contractor, the Department or others.

The Contactor shall verify that all electrical equipment, conduits and trays, whether furnished by the Contractor, the Department or others, are provided with permanent identification or labeling. All labeling not already provided shall be furnished and installed by the Contractor. Handwritten and non-permanent labels already installed by others that do not meet the requirements of this specification shall be removed and new labeling installed per these requirements.

The intent of the final labeling is to allow the Department or persons contracted by the Department to identify any part of the electrical system through physical identification of electrical components at the specified point without the use of electrical, electronic or mechanical means of identification.

Device labels shall be installed on the exterior of devices, when possible. Device labels may be installed on the interior of a device at the primary access point. Labels shall be installed in such a position as to be visible during normal maintenance of the electrical systems. Labels shall be installed on trays and conduits every 10 meters when visible. Labels shall be installed at every point of transition between conduits, cable trays and access points.

To maximize the legibility, no handwritten or non-permanent labels are allowed. Labels in exterior spaces shall be able to withstand extended exposure to the outdoor elements and shall have a useful life equal or greater to that of the component labeled.

Submittals

All submittals shall be made to the Engineer.

The Contractor shall submit physical samples of each style or type of labeling to be used for each application, including the actual numbering to be used in completing the labeling. Numbering shall be printed on each label and shall include the font, font size, pitch and shall be printed by the printing method to be used by the Contractor in completion of the labeling.

The labeling samples are intended to represent the quality and workmanship to be provided by the Contractor in the field.

Labeling of Electrical Equipment

The Contractor shall provide and install nameplates on all electrical equipment as identified on the plan sheets. All nameplates not already provided shall be furnished and installed by the Contractor. Letter height shall be consistent with existing labeling, but shall not be less than 3 mm minimum.

All electrical equipment, including TOS and RTU enclosures, transformers, electrical panels, panel boards, motors, motor starters, pushbutton stations, selector switches, terminal boxes, and the like shall be identified using engraved laminated plastic nameplates with white surface and black core letters, attached with threaded fasteners. The inscription shall be as shown on the plan sheets or shall be approved by Owner.

A removable circuit directory shall be made for each lighting and distribution panel, and labeled with the function of each circuit on the panel. All directories shall be of a non-corrodible material.

Labeling of Trays

All trays shall be labeled as shown on the plan sheets and the conduit schedules. Tray labels shall be spray painted using alphabet and number stencils. The tray identifier shall be painted on the vertical exterior side of the tray using black lettering on a white background. Letter height shall be 50 mm minimum.

Exposed Conduits

All conduits shall be labeled as shown on the plan sheets and the conduit schedules. The conduits shall be tagged at both ends with 50 mm round brass tags. The conduit numbers shall be stamped onto the tag. Letter height shall be 5 mm minimum, unless otherwise stated. The tags shall be strapped to the conduits with stainless steel wires or tie wraps inserted through holes, drilled through the tag.

Underground Conduits

All underground conduits shall be labeled as shown on the plan sheets and the circuit schedules. The conduit identifier shall be spray painted using alphabet and number stencils. The conduit identifier shall be painted on both conduit ends, above each conduit, on the interior wall of the manholes. Letter height shall be 50 mm minimum using black lettering on a white background.

10-3.18 STATE-FURNISHED ROADWAY LIGHT POLE AND FIXTURE

This work shall include installing, delivering, assembling, and inspecting State-furnished roadway light poles and fixtures and shall conform to the details shown on the plans and these special provisions.

Attention is directed to "State-Furnished Materials," of these special provisions regarding the 10 meter roadway light poles and fixtures.

Each light pole and fixture consists of the components shown on the plans.

SUBMITTALS

Prior to transporting the light poles and fixtures to the bridge site, the Contractor shall inspect the light poles and fixtures at the light pole and fixture storage location as specified in "State-Furnished Materials," of these special provisions.

The Contractor shall furnish the light poles and fixtures inspection report to the Engineer. The light pole and fixture inspection report shall include the condition of light poles and fixtures and any existing damages that may have occurred prior to the Contractor's delivery. If no damage is found, the Contractor shall include a statement in the light pole and fixture inspection report to state that the light poles and fixtures are in good condition and acceptable for delivery and installation.

Each light pole and fixture shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

INSTALLATION

The light poles and fixtures shall be installed according to manufacturer's recommendations.

Damaged light pole and fixture during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

PAYMENT

Full compensation for installing State-furnished roadway lighting pole and fixtures including inspection, delivery, and assembly of the bikepath landing lighting poles and fixtures shall be considered as included in the contract lump sum price paid for roadway and girder level eastbound and no separate payment will be made therefor.

10-3.19 STATE-FURNISHED BIKEPATH LANDING LIGHT POLE AND FIXTURE

This work shall include installing, delivering, assembling, and inspecting State-furnished bikepath landing light poles and fixtures and shall conform to the details shown on the plans and these special provisions.

Attention is directed to "State-Furnished Materials," of these special provisions regarding bikepath landing light poles and fixtures.

Attention is directed to "Miscellaneous Metal (Bridge)," of these special provisions, regarding the pedestals for bikepath landing light poles and fixtures.

Each light pole and fixture consists of the components shown on the plans.

SUBMITTALS

Prior to transporting the light poles and fixtures to the bridge site, the Contractor shall inspect the light poles and fixtures at the light pole and fixture storage location as specified in "State-Furnished Materials," of these special provisions.

The Contractor shall furnish the light poles and fixtures inspection report to the Engineer. The light pole and fixture inspection report shall include the condition of light poles and fixtures and any existing damages that may have occurred prior to the Contractor's delivery. If no damage is found, the Contractor shall include a statement in the light pole and fixture inspection report to state that the light poles and fixtures are in good condition and acceptable for delivery and installation.

Each light pole and fixture shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

INSTALLATION

The light poles and fixtures shall be installed according to manufacturer's recommendations.

Damaged light pole and fixture during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

PAYMENT

Full compensation for installing State-furnished bikepath landing lighting pole and fixtures including inspection, delivery, and assembly of the bikepath landing lighting poles and fixtures shall be considered as included in the contract lump sum price paid for underground and roadway at grade and no separate payment will be made therefor.

10-3.20 BIKEWAY LIGHTING

GENERAL

Bikeway lighting consists of bikeway light poles, and bikeway lighting luminaires.

Bikeway light poles, and bikeway lighting luminaires shall be furnished at the locations shown on the plans and shall conform to the details shown on the plans, the manufacturer's specifications, and these special provisions.

Bikeway light poles, and bikeway lighting luminaires shall be installed at locations shown on the plans, in conformance with the details shown on the plans, the manufacturer's specifications and these special provisions.

MATERIALS

Bikeway lighting luminaires shall be "Lithonia Lighting ALX1 14000L SR2 480 SPA DWHXD"

Bikeway light poles, including base plates and anchor bolts, shall be "Lithonia Lighting SSS 20 5C DM19 GV/DWH BC".

The color for bikeway lighting luminaires, and bikeway light poles shall be an equal blend of Federal Standard Colors No. 27925 and No. 27880.

Sole Source Supplier

Arrangements have been made for the successful bidder to obtain the Lithonia lighting luminaires and light poles from the following distributor at 16500, at 2001 Broadway 4th Floor, Oakland, California 94612, Telephone (510) 208-5005.

The unit price quoted by the manufacturer for bikeway lighting luminaire "Lithonia Lighting ALX1 14000L SR2 480 SPA DWHXD" is $963.35, not including delivery and sales tax.

The unit price quoted by the manufacturer for bikeway light pole "Lithonia Lighting SSS 20 5C DM19 GV/DWH BC" is $623.35, not including delivery and sales tax.

The above prices will be firm for orders placed on or before December 31, 2012.

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 Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list including spare parts, and the manufacturer's operating, maintenance and service instructions.

Foundation

The foundations for the bikeway light poles shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications, and "Concrete Structures," "Reinforcement," and "Subgrade Enhancement Geosynthetic," of these special provisions.

The concrete bikeway lighting foundation shall be constructed of concrete containing not less than 325 kg of cementitious material per cubic meter.

Bar reinforcement to be epoxy coated in conforming to the requirement in Section "Epoxy-Coated Prefabricated Reinforcement," and "Reinforcement," of these special provisions.

INSTALLATION

Each light bikeway light poles and luminaires shall be handled and transported in a manner that assures protection during transportation, on-loading, and off-loading.

Damaged bikeway light poles and luminaires during loading, shipping, and installation must be replaced by the Contractor at the Contractor's expense as specified in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications. No extension of time or compensation will be made for replacement light pole and fixture.

MEASUREMENT AND PAYMENT

Furnish bikeway light pole will be measured and paid for by the unit as furnish bikeway light pole. The quantity of furnish bikeway light pole will be determined from the actual count.

Furnish bikeway lighting luminaire will be measured and paid for by the unit as furnish bikeway lighting luminaire. The quantity of furnish bikeway lighting luminaire will be determined from the actual count.

The contract unit price paid for furnish bikeway light pole shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing the work involved in furnishing bikeway light pole, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for install bikeway lighting luminaire shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing the work involved in furnish bikeway lighting luminaire, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for installing bikeway light poles and bikeway lighting luminaires, and providing foundations including furnishing and placing epoxy coated bar reinforcement, Class 3 aggregate base and subgrade enhancement geosynthetic shall be considered as included in the contract lump sum price paid for underground and roadway at grade, and no separate payment will be made therefor.

10-3.21 MODEL 334 CONTROLLER CABINETS

The Model 334 cabinets shall conform to the provisions in Section 86-3.01, "Controller Assemblies," of the Standard Specifications and these special provisions.

Cabinets shall be Model 334 and shall consist of a housing (A), a mounting cage 1, and the following listed equipment. The equipment shall conform to Chapter 6 of the Transportation Electrical Equipment Specifications (TEES).

1. Service panel No. 1
2. Power distribution assembly
3. Input file No. 3, upper part
4. Police door with on/off control switches
5. C1 harness
6. Controller and equipment shelves
7. Dual fan assembly with thermostatic control
8. Mechanical armature-type relays

Police panels will not be required.

Prior to shipping to the project site, each Model 334 cabinet shall be submitted to the Transportation Laboratory for acceptance testing.

The Engineer shall be notified when each Model 334 cabinet is ready for the functional test. The functional test will be conducted by State forces.

The following equipment shall be provided with each power distribution assembly:

1. Two each of Duplex NEMA 5-20R controller receptacle
2. One each of 30 A, 1-pole, 120 V(ac) Main circuit breaker
3. One each of 15 A, 1- pole, 120 V(ac) circuit breaker
4. Two each of 20 A, 1- pole, 120 V(ac) circuit breaker

Three shelves shall be furnished as shown on the plans. Each shelf shall be attached to the tops of 2 supporting angles with 4 screws. Supporting angles shall extend from the front to the back rails. The front of the shelf shall abut the front member of the mounting cage. The shelves shall be arranged as shown on the plans. The angles shall be designed to support a minimum of 23 kg each. The horizontal side of each angle shall be a minimum of 75 mm. The angles shall be vertically adjustable.

Three terminal blocks shall be furnished as shown on the plans. Terminal blocks shall conform to the requirements in Chapter 6 of the TEES, except that the screw size shall be 8-32.

A maintenance manual shall be furnished for all controller units, auxiliary equipment, vehicle detector sensor units, control units, and amplifiers. The maintenance and operation manuals may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, before purchasing. The maintenance manual shall include the following:

1. Specifications
2. Design characteristics
3. General operation theory
4. Function of all controls
5. Trouble shooting procedure (diagnostic routine)
6. Block circuit diagram
7. Geographical layout of components
8. Schematic diagrams
9. List of replaceable component parts with stock numbers

10-3.22 STATE-FURNISHED CONTROLLER ASSEMBLIES

The Model 170 controller assemblies, excluding anchor bolts, 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 334 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the service platform or foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller units. The Contractor's responsibility for controller units shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

CONTROLLER ASSEMBLIES POWER STRIP

The Contractor shall furnish and install one rack-mount surge power strip with a switch in each State-furnished Model 334 controller cabinet. The power strip shall conform to the provisions in "Rack-Mounted Power Strip" of these special provisions.

10-3.23 HIGH MAST LIGHTING ASSEMBLY

The high mast lighting assembly shall include the foundation, pole, luminaire lowering device system, and luminaires, as shown on the plans and in conformance with these special provisions.

Comply with the requirements in "Cast-In-Drilled-Hole Concrete Pile Foundations," "Cast-In-Drilled-Hole Concrete Piles," and "Corrosion Control for Portland Cement Concrete," of these special provisions.

GENERAL

Installation of the lowering device on each pole shall be made under the supervision of a trained representative of the lowering device manufacturer. Prior to acceptance of the contract, a trained representative of the lowering device manufacturer shall demonstrate that each high mast lighting assembly operates properly. The demonstration shall consist of a minimum of 3 complete cycles of raising and lowering the luminaire ring (complete with luminaires) the full length of the ring's travel, as designed, within one working day, prior to acceptance of the project.

All portions of the high mast lighting assembly shall have a minimum design wind velocity rating of 190 km/h.

The lowering device system shall be submitted for inspection and testing. Inspection and testing shall be performed at a site in California approved by the Engineer. The lowering device system shall be demonstrated at the Contractor's expense. Notification shall be given to the Engineer at least 7 days prior to demonstration.

After the high mast lighting system is in operation, an instructional video tape (VHS) or DVD, complete written instructions and a demonstration to State Maintenance personnel on the maintenance of the high mast lighting assembly, including leveling of the luminaire ring and the procedures for the safe raising and lowering of the luminaire ring, shall be provided.

Spare parts, part lists and the operating, maintenance and service instructions, packaged with or accompanying the equipment installed on the project, shall be delivered to the Engineer prior to acceptance of the project.

SUBMITTALS

Submittals for the high mast lighting assembly shall conform to the provisions in Section 86–1.04, "Equipment List and Drawings," of the Standard Specifications and these special provisions. Submittals shall be delivered to the Engineer at least 45 days prior to erection of the high mast lighting assembly. The Engineer shall be allowed 45 days for the review of submittals. Review areas will include structural, welding, electrical and other areas as determined by the Engineer.

1. Descriptive data, design working drawings, erection working drawings (including aiming directions for each luminaire if the luminaire has an asymmetrical light distribution), isolux diagram for each type of luminaire, calculations, and a list of the material used for the high mast lighting assembly shall be submitted to the Engineer. The material list shall be complete with the name of manufacturer, catalog number, size, capacity, finish, pertinent ratings and identification symbols used on the plans or in the special provisions for each unit.
2. Each submittal shall consist of 5 copies.
3. Plans and detailed drawings shall be not larger than 559 mm x 864 mm.
4. Each separate item submitted shall bear a descriptive title and the State contract number.

Two copies of the submittals shall be forwarded to the Office of Structure Design. The Engineer shall be given a copy of the cover letter or other notification, and date, that the copies were sent to the Office of Structure Design.

INSPECTION

The high mast light poles will be inspected at the fabrication site. The Engineer shall be notified when materials have been delivered to the fabrication site. After delivery, the Engineer shall be given at least 10 days notice before fabrication of the light poles commences.

If all or a portion of the high mast poles are fabricated more than 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 said High Mast Light Poles will be reduced by $2500 for each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional $2500 ($5000 total) for each fabrication site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

CORROSION RESISTANCE

Corrosion resistance shall be provided. Methods shall include the following:

1. Avoidance of contact between stainless steel and carbon steel, between different types of stainless steel (including welding material), and between aluminum and ferrous materials.
2. Utilizing continuous welding to eliminate crevices which retain moisture.
3. Minimizing welding of stainless steel.
4. Use of adequate sections and suitable materials to limit stress related corrosion.

POLE

The pole shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and these special provisions.

The pole shall include shaft, access hole, access hole cover, support plate and anchor base.

The shaft shall consist of sections of a round or multisided (16 sides) tapered steel tube with a uniform taper of approximately 12 mm per meter. Segments of multisided poles shall be convex and shall have a minimum bend radius of 100 mm. The pole shall be hot-dip galvanized after fabrication in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. Steel used in fabricating the pole shall be a weldable quality steel. No field welding shall be performed in the assembly of the pole.

The pole shall have a reinforced access hole to allow adequate clearance for maintaining and servicing the lowering device. Access hole reinforcement shall provide a bending strength equal to that of the pole without an opening. Other hardware inside the pole shall accommodate the lowering device.

The access door shall be hinged to the pole, open horizontally 180 degrees, and when in the open position shall not interfere with access to the interior of the pole.

The pole shall be erected plumb. The vertical axis of the erected pole shall be within 75 mm of the theoretical vertical axis when measured without the action of sunlight or wind.

The pole shall conform to the requirements of the latest edition and interim revisions of the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The maximum allowable wind deflection shall not exceed 14 percent of the pole height.

An embossed aluminum plate shall be attached with rivets to the outside of each pole approximately 50 mm above the access hole. The nameplate shall indicate the name of the pole manufacturer and the height of the pole.

A plastic laminated data sheet shall be secured on the inside of the access hole door. The data sheet shall include the names, addresses and telephone numbers of the manufacturers of the pole, luminaire lowering device and luminaires, and the design parameters, including wind velocity, luminaires (number, wattage, model number, mass, projected area and coefficient of drag), and the mass, projected area and coefficient of drag for the pole top lowering mechanism.

LUMINAIRE LOWERING DEVICE

The luminaire lowering device shall consist of a head frame, a luminaire ring, an internal power drive winch unit, main breaker, and step-down transformer.

The maximum effective projected area of the total assembly at the top of the pole, exclusive of the luminaires, shall not exceed 0.5-m^2.

The mass of the head frame, luminaire ring and cover shall not exceed 340 kg.

The head frame shall be hot rolled steel conforming to the requirements in ASTM Designation: A 36. The head frame shall be attached to the pole by means of a steel slip fitter and secured by a minimum of 4 stainless steel setscrews conforming to the requirements in ASTM Designation: F 880, Type 304. The head frame shall be hot dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

The head frame shall be fitted with at least 6 hoisting cable sheaves, of either galvanized or stainless steel, or aluminum, with a minimum 125-mm pitch diameter. The head frame shall be fitted with electrical power cable sheaves or rollers configured to provide a minimum bending radius as specified by the power cable manufacturer.

The hoisting cable sheaves and electrical power cable sheaves or rollers shall be fitted with suitable keepers to keep the cables in their tracks during pole erection and operation. The sheaves shall be supported by stainless steel shafts and shall be fitted with oil impregnated sintered bronze bushings or roller bearings.

At least 3 hoisting cables shall be supplied. The cables shall be 4.75-mm, minimum diameter, 7x19 strand, stainless steel aircraft cable, manufactured in conformance with the requirements in Military Specification MIL-8320B.

The head frame shall be provided with a cover designed for that device and securely attached with stainless steel machine screws conforming to the requirements in ASTM Designation: F 593, Type 304 and self-locking nuts conforming to the chemical requirements of ASTM Designation: F 594, Type 304, or a stainless steel clamp band. The shape of the lowering device and cover shall be symmetrical about a vertical axis.

The head frame shall also include a minimum of 3 latches which support the luminaire ring when the lowering device is not in operation. Latching shall be accomplished by the alternate raising and lowering of the luminaire ring by the winch and hoisting assembly. When the luminaire ring is raised to the top of the pole, the ring shall automatically latch and be secure in a locked position. Automatic signaling devices shall be visible to indicate that each latch of the luminaire ring is safely locked in place.

No moving latch parts or springs shall be attached to the head frame. Moving parts of the latching mechanism shall be attached to the luminaire ring and be serviceable from the ground.

The luminaire ring shall be fabricated of a 150 mm x 50 mm x 4.55 mm (7-gage), minimum, steel channel or a member of equal strength, with the appropriate number of 50-mm nominal steel tube or pipe mounting arms to accommodate the eight luminaires shown on the plans. The pipe shall conform to the requirements of ASTM Designation: A 53. The ring shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Roller contact, spring loaded, centering arms shall be provided which shall center the luminaire ring while ascending and descending the full length of designed travel on the pole. The arm system shall keep the ring concentric with the pole in winds up to 50 km/h. The rollers for the centering arms shall be a water resistant, non-marking material. Axle shafts for arms and rollers shall be stainless steel conforming to the requirements in ASTM Designation: A 276, Type 304. The arms system shall not allow the pole to be inadvertently wedged between the rollers and the luminaire ring. Ultimate support of the luminaire ring shall not be lost by individual or total spring failure.

Provisions shall be made for leveling the luminaire ring while in the lowered position. The luminaire support ring shall be level upon installation and again before completion of the contract.

A prewired 600-V(ac) terminal block in a NEMA Type 3R enclosure and a weatherproof power receptacle shall be mounted on the luminaire ring raceway. When the luminaire ring is lowered to ground level, the receptacle shall enable the luminaires to be energized and tested.

An electrical cable of sufficient length to power the luminaire ring, and with appropriate electrical connections, shall be provided to test the luminaires while in the lowered position. A circuit breaker of the rating shown on the plans and an outlet box shall be provided in the pole base.

Electrical cords shall be attached to a weather-tight wiring chamber through weather-tight cable connections. The main power cord shall support its full weight when installed. A positive connection between cord segments shall be provided across cord joints to prevent stress on the joints.

Power cable shall be Type SO, rated for 600 V(ac) with the number and size of conductors as required. Luminaire ring distribution cord shall be Type ST with insulation suitable for 105°C. Twist-lock receptacles (male and female) shall be provided and shall be rated at a minimum of 30-A, 480-V(ac).

The internal drive mechanism shall raise or lower the luminaire ring at an approximate speed of 3.3 m per minute. The winch shall be furnished with 6-mm minimum diameter 7x19 strand stainless steel aircraft cable, conforming to the requirements in Military Specification MIL-8320B and of sufficient length to maintain at least 4 wraps around the drum with the luminaire ring in its fully lowered position. Winch cable shall wind uniformly.

The internal power drive winch unit shall include:

1. A heavy duty, totally enclosed, fan cooled, reversible universal type motor, rated at 120 V, 746 W, minimum, for continuous duty, and provided with overcurrent protection.
2. An adjustable torque limiter with ball or roller bearings on all rotating shafts.
3. A remote control reversing switch (labeled "UP" and "DOWN") with minimum 6-m cord.
4. Worm-gear driven winch.
5. Mounting frame.
6. Weatherproof step-down transformer, 480 V-120 V, 2.0 kVA, to supply the motor and provided with overcurrent protection. The transformer, when installed inside the pole, shall be removable without removing other components.
7. Other equipment as necessary.

Internal power drive winch unit components, including transformer, shall be removable through the access hole for repair or replacement.

LUMINAIRES

Each luminaire shall consist of housing, a reflector, a refractor or lens, ballast, a lamp socket and a lamp.

Housings shall be fabricated of aluminum. Housings that are painted shall withstand a 1000-hour salt spray test in conformance with the requirements in ASTM Designation: B 117. Metal component parts of the housing shall be fabricated from material at least equal in corrosion resistance and finish to the metal in the housing.

The optical system, consisting of the reflector, refractor or lens, lamp socket and lamp, shall be in a sealed chamber. Sealing shall be provided by a gasket between the reflector and refractor or lens, and a gasket between the reflector and lamp socket. The chamber shall have provision for filtered flow of air in and out of the chamber due to lamp heat. Filtering shall be accomplished by either a separate filter or a filtering gasket.

The adjustable component (refractor or reflector) controlling the orientation of the light distribution of asymmetrical luminaires shall be rotatable 360 degrees around a vertical axis.

Each luminaire shall be provided with a slipfitter for mounting on a 50-mm horizontal pipe tenon and shall be adjustable to plus or minus 3 degrees from the axis of the tenon.

The surface of each reflector shall be specular and shall be silvered glass or aluminum protected by either an anodized finish or a silicate film. The reflector shall be shaped so that a minimum of light is reflected through the arc tube of the lamp.

Each refractor or lens shall be made of heat resistant glass.

Each lamp socket shall be a porcelain enclosed mogul-multiple type. The shell shall contain integral lamp grips to assure electrical contact under conditions of normal vibrations. The socket shall be rated for 1500-W, 600-V(ac), and 5000-V (ac) pulse (1000-W lamp).

Metal halide lamps shall be vertical burning, protected from undue vibration and prevented from backing out of the socket by a stainless steel clamp attached to the luminaire.

Each luminaire shall enclose a dual fuseholder and 2 fuses rated at 5 A at 480 V(ac). Each fuse shall be the standard midget ferrule type, with "Non-Time-Delay" feature, shall be ETL or UL listed, and shall be 10.3 mm x 38 mm.

The minimum light distribution for each luminaire shall be as shown on the plans.

BALLASTS

The ballast for each high mast luminaire shall consist of components (core and coils, capacitors and starting aid, if required) mounted within a weatherproof housing which integrally attaches to the top of a luminaire support bracket and lamp support assembly. The ballast shall be readily removable without removing the luminaire from the bracket arm.

Ballasts shall be electrically connected to the optical assembly by means of a prewired weather-proof quick disconnect.

Ballasts shall be the regulator type.

METAL HALIDE LAMP BALLASTS

For metal halide luminaires, the lamp wattage regulation spread at any lamp voltage, from nominal through the life of the lamp, shall vary not more than 22 percent for 1,000-W lamps, for a ±10 percent input voltage variation. The ballast starting line current shall be less than its operating current.

Other details of ballasts for metal halide luminaires shall be as specified by the luminaire manufacturer.

METAL HALIDE LAMPS

One thousand-watt metal halide lamps shall have an initial output of 100,000 lumens and an average rated life of 12,000 hours, based on 10 hours per start.

10-3.24 TRAFFIC OPERATION SYSTEM

The traffic operation system shall include the installation of camera stations, fiber optic system, preformed loop detector stations, and State-furnished Model 500 changeable message sign assemblies, as shown on the plans and in conformance with these special provisions.

CAMERA STATION

General

The Contractor shall furnish and install the following closed circuit television (CCTV) equipment at each camera station as described in these special provisions and as shown on the plans:

1. One integrated camera unit.
2. One CCTV pole and camera mounting adapter if required.
3. One camera control unit (CCU).
4. One video encoder unit (VEU).
5. Power strip.
6. Hybrid camera cable and connectors and fittings as required.
7. Interface cable and conductors as required.
8. Equipment shelf with brackets as required.

Installation of Camera Station

The Contractor shall install CCTV pole with foundation, conduits and pull boxes as required and as shown on the plans. The type of CCTV pole is shown on the plan and shall meet the specifications in these special provisions. The Contractor shall install and terminate the HCC with connectors as shown on the plans. The HCC shall connect to camera pigtail cable and secure to the pole as shown on the plans for strain-relief.

The integrated camera unit shall be installed on camera mounting plate as shown on the plans. The integrated camera unit shall be secured to the mounting plate using the stainless steel bolts provided with the integrated camera unit. Before each bolt is fastened, a locking type coating shall be applied to the threads. The coating shall lock the bolt and nut in place, making it impossible to turn the bolt or nut without tools. This coating shall last through and be effective through at least ten insertions and withdrawals of the bolt or nut.

The Contractor shall install CCU, VEU, router, power strip, 8-position connecting block, equipment shelves and all the interface cables in the controller cabinet as shown on the plans. The power strip shall be mounted on the rear mounting rack of the controller cabinet.

The Contractor shall furnish all materials necessary to provide a complete and functional camera station in accordance with these special provisions. Miscellaneous equipment and materials not mentioned but necessary to provide a complete and fully operational camera station shall be furnished by the Contractor as incidental to the work for which no additional compensation will be allowed therefore.

All items furnished under this contract shall be new and shall be the latest version.

Camera Station Testing

Upon completion of work, each camera station shall be subjected to post-installation tests as outlined herein. All software shall be provided and loaded before the start of testing The District Electrical Systems Branch personnel, arranged by the Engineer and in the presence of the Contractor, shall perform all tests. The Contractor shall notify the Engineer in writing 15 days prior to the scheduled testing. Upon receipt of the notification, the Engineer will contact Office of Electrical Systems at (510) 286-6142. The Contractor shall provide all necessary equipment required to access the CCTV equipment for testing.

The testing shall consist of five consecutive days of continuous satisfactory operation of each camera station. If any material and equipment furnished and installed by the Contractor in this project is found defective or otherwise unsuitable, or the workmanship does not conform to the accepted standards, the Contractor shall replace such defective material and equipment at no cost to the State.

The Contractor may offer rejected material or equipment for consideration provided all non-compliance has been corrected and pretested by the Contractor. After all defects have been corrected, the camera station shall be re-tested until five consecutive days of continuous satisfactory operation is obtained.

The post-installation tests shall consist of, but not be limited to, inspection and functional testing in accordance with these special provisions.

Inspection shall consist of, but not be limited to, verification of correct wiring terminations, correct cable interconnections, good workmanship and compliance with these special provisions.

Functional testing shall include, but not be limited to, the following:

1. Verify all local mode CCTV operations using the CCU front panel controls.
2. Verify video signal output from CCU with a National Television Systems Committee (NTSC) monitor.
3. Verify the correct operation of the auto/manual iris and focus, and manual zoom functions.
4. Verify the correct operation of the pan/tilt function. The pan/tilt function shall be tested over 355 degrees in the horizontal plane and +20 to -90 degrees in the vertical plane
5. Verify the correct operation of the preset positions.

INTEGRATED CAMERA UNIT

General

Each integrated camera unit shall consist of a camera, lens, receiver/driver, pan/tilt assembly, environmental housing, sunshield and pigtail cable with connector. The integrated camera unit shall automatically switch to monochrome mode when ambient light level is at 200 lux and switch back to color at 1,800 lux.

Each integrated camera unit shall be assembled, inspected and tested in accordance with these special provisions prior to delivery to the job site. Installation, operations and maintenance manuals shall also be submitted at the time of delivery. The Contractor shall submit the applicable documents of the U.S. Military Specification (MIL-SPEC), Underwriters Laboratories Inc. (UL), Electronics Industries Association (EIA) Standards and other Standards from parts of the specification to the extent specified in these standards. In the event of a conflict between the content of this section and the content of the specification, the standards defined in this section shall supersede.

Military Specification Documents	
ANSI/NCSL Z540-1	Calibration System Requirements.
MIL-STD-461A	Electromagnetic Interface Characteristics Requirements for Equipment, Subsystems & Systems, Aug. 1, 1968
MIL-E-5400T	Electronic Equipment, Airborne General Specification
MIL-STD-810E	Environmental Test Methods, 31 July 1995.
MIL-C-5541E	Chemical Conversion Coatings on Aluminum Alloys, 30 Nov 1990.

Underwriters' Laboratory, Inc. and other documents	
UL-796	Printed Circuit Boards
ANSI/EIA-170A	Electrical Performance Standards Color Television Studio Facilities
ANSI/EIA-330	Electrical Performance Standards for Closed Circuit Television (CCTV) Camera 525/60 Interlaced

Camera

Each camera shall meet the following specifications at a minimum:

Imager	Interline transfer Progressive Scan CCD with mosaic-type color compensating filter
Image Area	6.4 mm Format, 3.6 mm (H) x 2.7 mm (V)
Resolution	540 horizontal; 350 vertical
Picture Elements	811 (H) x 508 (V), Total 411,988
Video Output	NTSC, 1 V(p-p) at 75 ohms, unbalanced
Lens	Aperture: f/1.4 (wide angle) to f/4.2 (telephoto)
Optical Zoom Range	35X, 3.4 mm to 119 mm
Digital Zoom Range	1X (Off) through 210X, Smooth transition from Optical to Digital Zoom
Horizontal Angle of View	Optical: From 55.8 to 1.7 degrees; At 10X Digital: From 55.8 to 0.17 degrees.
Focus Distance.	1016 mm telephoto, 10.2 mm wide angle
Digital Compass	8 or 16 direction point compass annotation with primary direction spelled out and intermediate directions abbreviated with two letters
Auto Focus	Selectable Auto/Manual
Manual Focus Speed	Approximately 2.0 seconds to full range
Minimum Scene Illumination	For Reliable Auto Focus, 30 percent video
Zoom & Focus Presets	64 preset positions with auto focus and ID
Flash Memory	Update firmware and new features via serial communication
Shutter speeds	1/60; 1/120; 1/180; 1/250; 1/500; 1/1,000; 1/2,000; 1/4,000; 1/10,000; 1/30,000 second
Auto Iris	Automatically adjusts to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications
Manual Iris	Changing the video level to give the effect of open iris/close iris
Gamma	0.45
AGC	From 0 to 28 dB
Color Balance	Auto Tracking Color Balance/Manual with adjustable Red and Blue Levels
Signal to Noise Ratio	>50 dB
Synchronization	Crystal or Phase-Adjust Line Lock on 60 Hz
Sensitivity	At F1.4, Wide Angle 35 IRE 0.5-Lux at 1/60 s, F1.4, Shutter, Color I.R. Cut On 0.05-Lux at 1/2 s, F1.4, Shutter, Color I.R. Cut On 0.2-Lux at 1/60 s, F1.4, Shutter, monochrome mode I.R. Cut Off 0.01-Lux at 1/4 s, F1.4, Shutter, monochrome mode I.R. Cut Off

Pan and tilt function specifications:

1	Continuous rotation capability in either direction
2	110 degrees of tilt movement, from +20 to –90 degrees unobstructed
3	Pan Speed (Operator Control): Variable from 0.1 to 80 degrees/s
4	Pan Speed (Preset Control): >140 degrees/s
5	Tilt Speed (Operator Control): Variable from 0.1 to 40 degrees/s
6	Tilt Speed (Preset Control): 140 degrees/s
7	64 Pan and Tilt preset positions with repeatability within ±0.5 degrees
8	The positioning system shall be invertible if inverse mounting is required

The integrated camera unit shall have eight programmable camera movement sequences. Each sequence is programmed by selecting the preset position by number, and then selecting a dwell time. The presets can be used in any order, and the same preset may be used more than once as long as the total number of preset positions used does not exceed 32. The dwell time defines the length of time paused at each preset position. It can be from 1 second to 60 seconds. The dwell time can be changed individually for all stops on the sequence. If the appropriate preset ID is programmed, it shall be displayed for each preset position used on the sequence. The sequence shall stop upon receipt of a pan command. All programmable functions shall be stored in non-volatile memory.

The camera housing shall be a corrosion resistant and tamper proof sealed and pressurized housing with 35 kPa dry nitrogen with Schrader purge fitting and 138 kPa relief valve for each camera. The size of the housing shall be 88.9 mm diameter or smaller. The housing exterior shall be finished by pre-treatment with conversion coating and baked enamel paint. The camera enclosure shall be designed to withstand the effects of sand, dust and hose-directed water.

The internal humidity of the housing shall be less than 10 percent, when sealed and pressurized. Desiccant packs shall be securely placed inside the housing to absorb any residual moisture and maintain internal humidity at 10 percent or less. The housing shall include a thermostatically controlled heating pad rated at 115 V(ac) 100 W maximum.

A sun shield or visor shall be provided to shield the lens from direct sunlight.

The integrated camera unit shall include a character generator. The text characters shall be uppercase white with black border impose on the video stream. A maximum of six lines of user programmable alphanumeric text shall be displayed through serial communications. Messages can be positioned at either the top or the bottom of display. The Right side positioning is accomplished by padding left side of message with spaces. Blank lines shall not be displayed. Any programmed line being displayed shall fill in toward the top if top positioning is selected, or toward the bottom if bottom position is selected.

Camera ID shall be used for upper 2 lines with each up to 24 characters long. If both lines are programmed, line 1 of Camera ID shall always appear above line 2 of Camera ID regardless of top or bottom selection.

Preset ID shall be 1 line, up to 24 characters long, user programmable for each of the 64 preset positions. When a preset position is recalled the corresponding preset ID shall be displayed. The preset ID shall remain displayed until a pan, tilt, zoom, manual focus, auto focus select, or another preset command is received.

An 8-point or 16-point compass annotation shall be settable for a true north position. Display shall include North, NE, East, SE, South, SW, West and NW. Position shall be able to be grouped with the site location or separated from site location. Azimuth and elevation position shall be displayed in 0 - 359 degrees and +95 to –95, respectively. All display shall be user selectable for enable/disable, 3-second time out or permanent display. Sector Message of up to 16 sectors in 360° shall be defined with up to 24 characters long.

Low-pressure indicator shall use 1 line with messages displayed in "blinking" or "non-blinking" mode when activated by low internal pressure. Adjustable set points by altitude shall be provided via the serial port to activate low-pressure. Message shall be enabled or disabled. In maintenance mode readings of the internal pressure of the camera housing shall be displayed from 34.5 kPa down to 6.9 kPa, in 0.69 kPa increments.

Physical and Mechanical Requirements

Each integrated camera unit shall not weight more than 9 kg. Its dimensions shall not exceed 356 mm length, 178 mm width and 305 mm height (Including mounting base.) The integrated camera unit shall be pole mount version. There shall be four equal spaced mounting holes on the mounting base. Each integrated camera unit shall be provided with four stainless steel hex head bolts to secure the integrated camera unit to the camera mounting plate. All fasteners and nuts used in attaching the integrated camera unit to the mounting plate shall be of grade 18-8 stainless steel. Camera-mounting adapter and plate shall match the bolt hole pattern of the camera.

Power Requirements

The integrated camera unit shall operate between voltage from 89 to 135 V(ac), 120 V(ac) nominal voltage and 50 or 60 Hz. (±3.0 Hz). The integrated camera unit shall conform to National Electrical Manufacturers Association (NEMA) standard TS-2 for traffic control system 2.1.2. The integrated camera unit shall meet the requirements of Section 2.1.6 "transients, power service" of the NEMA standard TS-2. The line variation and surge performance shall be tested to meet these specifications by an outside agency, other than the camera manufacturer. The tests shall be provided upon request. The power consumption shall not exceed a total of 200 watts, in which 100 watts for camera, receiver, pan/tilt driver and 100 watts for heater on.

Environmental Requirements

The integrated camera unit shall operate in ambient temperature range from -34to +74°C, in relative humidity up to 100 percent. The unit shall operate when exposure to sand, dust, fungus and salt atmosphere per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, 3.2.24.9 and with shock for up to 10 Gs, 11 ms, in any axis under non-operating conditions, per MIL-E-5400T, para 3.2.24.6. The unit shall not be damaged with sine vibration from 5 to 30 Hz, 1/2 G, 3 axis in one hour.

Camera Pigtail and Connector

The camera pigtail cable shall conform to the provisions in "Hybrid Camera Cable and Connectors," of these special provisions. The length of the camera pigtail cable shall not be less than 813 mm. The terminating connector shall be equivalent to an Amphenol 206036-3 with back shell 206070-1.

The contact pin assignment of the connector shall be:

Position	Function	Position	Function
1	Video, 75 ohm	9	Not Used
2	Video Ground	10	Not Used
3	Data Ground	11	Not Used
4	Tx-	12	115 V(ac) Line, Hot
5	Tx+	13	115 V(ac), Neutral
6	Rx+	14	Not Used
7	Rx-	15	115 V(ac), Ground
8	Not Used	16	Not Used

The Contractor shall furnish a mating connector, Amphenol 206037-1 with back shell 206070-1 and sixteen contact crimping sockets for each integrated camera unit supplied in the contract.

HYBRID CAMERA CABLE AND CONNECTORS

The hybrid camera cable (HCC) shall consist of one RG-59/U type analog video coaxial cable, one 6-No. 22 AWG conductor group, one 8-No. 26 AWG conductor group and a two twist pair 4-No. 26 AWG conductor group in a common outer jacket. The hybrid camera cable cross section is shown on the plans.

The coaxial cable shall conform to:

Electrical	Coax
Capacitance (picofarads/m nominal)	5.2
Impedance (ohms-nominal)	75
Velocity of propagation (nominal)	78 percent
Nominal Diameter (mm)	6.2
Insulation Rating	300

The cable attenuation at 20 C shall measure at maximum as:

Frequency (MHz)	Nominal dB/30.5 m
1	0.30
10	0.90
50	2.10

The coaxial cable physical measurements:

Component	Nominal O.D. (mm)
Copper center conductor	1.0
Foam polyethylene dielectric	4.6
Sealed APA tape with 1.5 mm overlap	5.5
Woven aluminum braid	6.1
PVC outer jacket	7.5

(APA = Aluminum polyolefin and aluminum with adhesive)

The 6-No. 22 AWG shall be stranded 7 x 30, tinned copper insulated with 0.29 mm nominal wall of S-R PVC and a nominal O.D. of 1.2 mm. The 6 conductors shall be color coded as follows:

1. Black
2. Red
3. Green
4. White
5. Blue
6. Yellow

The 8-No. 26 AWG shall be stranded 7 x 34, tinned copper insulated with 0.29 mm nominal wall of S-R PVC and a nominal O.D. of 9.4 mm. The 8 conductors shall be color coded as follows:

1. Brown
2. Blue
3. Orange
4. Yellow
5. Purple
6. Gray
7. White with Black Stripe
8. Red with Green Stripe

The 4-No. 26 AWG in 2 twisted pairs shall be stranded 7 x 34, tinned copper insulated with 0.29 mm nominal wall of S-R PVC and a nominal O.D. of 9.4 mm. The 4 conductors shall be color coded as follows:

Pair 1
1. Black
2. White

Pair 2
3. Red
4. Green

The HCC shall also have a 36 AWG tinned copper braid with 90 percent coverage, an O/A binder of 0.0255 mm polyester 25 percent overlap, and an outer jacket conforming to: color to match Fed-Std-595 color No. 24091, material 0.81 mm dark gray UV resistant PVC to 10.8 mm O. D. and must pass the VW-1 vertical flame test. Fillers shall be used as required to form a uniform round cable. The insulation rating of the overall cable jacket shall be 300 V.

The manufacture identification shall be surface printed in white ink every 305 mm along the length of the cable.

The HCC shall be continuous from the integrated camera unit to CCU in the controller cabinet without splicing, unless shown on the plan or approved by the Engineer. The maximum length of HCC is 230 m.

The HCC shall be terminated with cable connectors on both ends. Connector AMP 206036-3 with a full set crimp contact pins and strain relief back shell, AMP 206070-1 shall be installed on the cable end toward CCU. Connector AMP 206037-1 with a full set crimp contact sockets and strain relief back shell, AMP 206070-1 shall be installed on the cable end toward the integrated camera unit. All connector contact shall be constructed with brass contact body material and with stainless steel spring that are sub-plated with 0.00127 mm nickel and plated with 0.00076 mm gold. Contact size shall be 16. AMP No. 305183 contact extraction tool shall be used to replace contact. AMP hand tool assembly 58495-1 with die assembly 58495-2 shall be used to place contacts on to each conductor. No other tool, unless approved by the Engineer shall be used for this work.

Inspection and Testing

Testing of HCC and connectors shall be performed in accordance with provisions in Section 86-2.14B, "Field Testing" of the Standard Specifications and these special provisions. Any cable lengths found to have faults shall be replaced and retested. The Contractor shall dispose of the removed faulty cable. The cable termination shall be randomly inspected for contact crimping quality control. Any contact found not crimped with the correct crimping tool and is defect shall be rejected. The Contractor shall redo the termination until all defects are corrected.

Prior to the beginning of work, the coaxial cable length of HCC shall be tested for attenuation and faults to ensure compliance with specifications contained herein using a time domain reflectometer (TDR). For the purpose of these special provisions, one or more of the following defines a fault in a long length of cable:

1. Return loss measurements indicating that attenuation exceeds 3 dB at 5 MHz to 30 MHz in a portion of cable less than 3 m long.
2. A return loss measurement indicating that there is a short in the cable.
3. A return loss measurement indicating a cut or open circuit in the cable.
4. A visual inspection that reveals exposure of or damage to the cable shielding.

INTERFACE CABLES

General

All interface cables when required to interface with other equipment as shown on the plan shall be minimum of 1.8 m in length. All interface cables shall be commercially made high quality type with appropriate connectors on the cable ends as shown on the plans.

Network Straight Through Data Cable

The network straight through data cable shall be made of Ethernet twisted pair cable (ETPC) and terminated with an 8-conductor, 8P8C modular plug on both ends. ETPC shall consist of 4 unshielded twisted pair (UTP) No. 24 AWG stranded copper conductors insulated with high-density polyethylene (PE). The insulated conductors shall be tightly twisted into individual pairs and jacketed with PE or PVC. Each Ethernet cable shall be compliant with EIA/TIA-568 Category 5E standards. The maximum DC resistance shall be 0.088 Ω/m at 20 °C. The mutual capacitance shall be 44.8 pF/m nominal. The characteristics impedance shall be 100 Ω ±15 percent from 1 MHz to 100 MHz.

The data cable shall be color coded as follows:

PAIR	COLOR CODE (TIP//RING)	8-position 8P8C Modular Plug's No.
1	White/Blue Stripe // Blue	5//4
2	White/Orange Stripe // Orange	3//6
3	White/Green Stripe // Green	1//2
4	White/Brown Stripe // Brown	7//8

Video Patch Cable

The video patch cable shall be RG-59/U coaxial cable terminated at both end with BNC connectors. The coaxial cable shall conform to:

Electrical	Coax
Capacitance (picofarads/m nominal)	52.8
Impedance (ohms-nominal)	75
Velocity of propagation (nominal)	78 percent
Nominal Diameter (mm)	6.2

The cable attenuation at 20 °C shall measure at maximum as:

Frequency (MHz)	Nominal dB/ 30.5 m
1	0.30
10	0.90
50	2.1

The coaxial cable physical measurements:

Component	Nominal O.D. (mm)
Copper center conductor	1.0
Foam polyethylene dielectric	3.7
Sealed APA tape with 1.5 mm overlap	5.5
Bare copper braid	6.1
PVC outer jacket	7.5

(APA = Aluminum polyolefin and aluminum with adhesive)

ANSI/EIA-232 Data Patch Cable

The ANSI/EIA-232 data patch cable shall meet ANSI/EIA-232 standard. The data cable shall have multiple No. 20 AWG conductors with (UL) Type CM shielded or AWM 2464 80C 300 Volts – C (UL). One end of data cable shall be terminated with a DE9 female connector. All contact socket pins shall be gold plated. The contact pin assignment is shown on the plans. The other end of the data cable shall be either terminated with an 8-conductor, 8P8C modular plug or not terminated. When there is no connector required on the other end of cable, each conductor's insulation shall be stripped 6.4 mm long from the end of cable and the bare conductor shall be tinned with solder.

Fiber Patch Cable

The fiber patch cable shall be single mode tight buffer tube indoor rated cable with ST connectors terminated on both ends. The fiber patch cable shall have yellow color outside jacket.

RACK-MOUNTED POWER STRIP

Electrical

Each rack-mount power strip shall meet the following requirements:

1. A maximum rating of 15 A, 120 V(ac), 60 Hz.
2. A surge protection with UL 1449 Clamping Level of 400 V, an IEEE Let-Through Voltage rating of less than 336 V, a single-pulse energy rating of 210 J and EMI/RFI noise protection rating of 40 dB.
3. One 15 A circuit breaker.
4. One internally illuminated switch to cut off power to all outlets.
5. Six NEMA 5-15R outlets.

Mechanical

Each rack-mount power strip shall meet the following requirements:

1. Dimensions of 51 mm (H) x 483 mm (W) x 71 mm (D) maximum and shall not weigh more than 2.0 kg.
2. The front plate of the power strip shall have two cut-off ANSI/EIA mounting screw holes on each end.
3. Each outlet shall have 38 mm minimum spacing center-to-center to its adjacent outlet.
4. The power cord shall enter from the rear with a length of 2.1 m minimum.
5. The clearance between the power cord entrance and the nearest outlet shall be 86 mm minimum.
6. Both the circuit breaker and the switch shall be front-mounted.
7. Each outlet shall be rear-mounted.

The power strip shall be plugged into the non-GFCI duplex outlet normally labeled with "Controller Unit Receptacle" in the back of the power distribution assembly (PDA). The power strip shall be mounted on the rear of the standard ANSI/EIA-310 rack cage and across the two vertical back rails with four stainless steel ANSI/EIA mounting screws, two on each side. The power strip shall not hinder the accessibility to the back of all existing electrical equipment. All power cords for permanently field installed electrical equipment shall be plugged into the power strip.

CAMERA CONTROL UNIT

General

The Contractor shall furnish and install camera control units (CCU) at each field CCTV assembly location. The camera control units shall consist of a rack-mounted field unit. The camera control unit shall have the same manufacturer as the integrated camera unit. The camera control unit shall be designed to provide on-site camera control functions. The control functions shall include pan/tilt positioning, zoom in/out control, auto/manual focus, and auto/manual iris.

CCU shall include a local/remote switch that transfers control from the remote system to local. This shall allow the remote control system and the CCU to remain connected while transfer the control function without disconnection of the camera site equipment. The local function shall time-out and return to remote mode in 10 minutes.

LED indicators on the CCU shall provide positive feedback of the automatic and manual mode status of the camera focus and iris functions, and the manual mode status of the pan/tilt function.

Physical and Mechanical Requirements

Each CCU shall mount in 44.5 mm (1 rack unit) of ANSI/EIA-310 rack space with a maximum depth of 356 mm. The front panel shall be black gloss color Number 17986 as per Federal Standard Color Chart 595B. The front and rear panel lettering shall be white color Number 17886 as per Federal Standard Color Chart 595B.

A high-impedance front and rear panel jack bayonet nut connector (BNC) shall be installed on the front and rear panel as shown on the plans. These connectors shall provide video input to a test monitor without affecting the remainder of the CCTV system. These connectors shall be directly monitoring the video input from the camera. The connectors shall be of copper material with bright nickel (tarnish resistant) finish for the body and silver finish for the contact.

A automobile glass (AG), size 6.4 mm x 31.8 mm, slow blow fuse shall be installed and replaceable from the outside of the unit.

Switches shall protrude no more than 12.7 mm from the front panel and shall be mounted as shown on the plans. Each switch shall be labeled as to their functions.

The rear panel connectors shall be mounted as shown on the plans and shall meet the following requirements:

1. Camera connector shall be of the following type or equivalent: AMP 206037-1, Square Flange type. The socket contacts for camera connector shall be constructed with brass contact body material and with stainless steel spring that are sub-plated with 0.00127 mm nickel and plated with 0.00076 mm gold. Contact size shall be 16. AMP No. 305183 contact extraction tool shall be used to replace contact.
2. The ANSI/EIA-232 connectors shall be a DE9 pin connector and ANSI/EIA-422 connector shall be a DE9 socket connector.
3. One mating connector, AMP 206036-3 with a full set crimp contact pins and strain relief back shell, AMP 206070-1 shall be supplied with each CCU supplied in the contract.

The Contractor shall provide all necessary interface cables for CCU to connect to all other camera equipment.

Each LED shall be high intensity, untinted, non-diffused. Each LED shall be mounted as shown on the plans.

An on/off switch to turn the CCU on/off shall be provided. An LED to indicate the AC power is on shall be provided.

Each CCU shall not weight more than 2.3 kg.

Electrical Requirements

Camera Control Functions

Each CCU shall have circuitry to detect the absence and presence of video sync on its video input. Each CCU shall have auto-iris override. Each CCU shall have a transfer switch between local and remote mode. The local function shall time-out and return to the remote mode within 5 minutes. A system-reset switch with momentary-pushbutton type shall be mounted on the front panel to function as external reset input to the microprocessor. The system-reset shall exercise the pan and tilt movements through their ranges and return the camera to the prior position. The system-reset function shall allow remote execution.

The CCU shall have, as a minimum, control and drive circuits for the following camera control functions:

Control Function	Switch Position
Pan momentary toggle switch	Left-Stop-Right
Tilt momentary toggle switch	Up-Stop-Down
Zoom In/Out momentary toggle switch	Telephoto-Stop-Wide Angle
Focus Automatic/Manual momentary toggle Switch	Auto Focus -Manual
Manual Focus toggle Switch	Near-Stop-Far
Iris Automatic/Manual toggle Switch	Auto Iris -Manual Override
Manual Iris toggle Switch	Open-Stop-Close
Remote/Local momentary toggle Switch (Local function shall time-out and return to remote mode in 10 Minutes)	Remote-Local
Reset momentary push button switch	Reset

Camera Connector Contact Assignment:

Position	Function	Position	Function
1	Video, 75 ohm	9	Not Used
2	Video Ground	10	Not Used
3	Data Ground	11	Not Used
4	Rx-	12	115 V(ac), Hot
5	Rx+	13	115 V(ac), Neutral
6	Tx+	14	Not Used
7	Tx-	15	115 V(ac), Ground
8	Not Used	16	Not Used

ANSI/EIA-232 Connector Contact Assignment (DE9 Pins):

Position	Function	Position	Function
1	Not Used	6	Not Used
2	Receive Data, Rx	7	RTS
3	Transmit Data, Tx	8	CTS
4	Not Used	9	Not Used
5	Signal Ground		

ANSI/EIA-422 Connector Contact Assignment (DE9 Sockets):

Position	Function	Position	Function
1	Tx+	6	Signal Ground
2	Tx-	7	Not Used
3	Signal Ground	8	Not Used
4	Rx+	9	Not Used
5	Rx-		

Communication and Camera Addressing Protocol

The execution of CCU functions, other than the hardware controls on the front panel, shall be done through either ANSI/EIA-232 or ANSI/EIA-422 optically isolated serial communication ports on the back panel. A minimum 9,600-baud data rate shall be used. The CCU shall have a front panel ANSI/EIA-232 port for connection to a local laptop computer. The (NTCIP) 1205 MIB communications protocol shall be included.

The communications between CCU and the integrated camera unit shall be conducted through an ANSI/EIA-422 circuit with full handshake support. A minimum 9,600-baud data rate shall be used. The CCU shall be 100 percent compatible with the protocol and data backbone architecture.

Power Consumption

The maximum power consumption for the CCU shall not exceed 45 W. Power consumption of equipment attached to CCU shall not exceed 250 W.

CCU to Laptop PC Cable

The Contractor shall furnish and install a universal serial bus (USB) to ANSI/EIA-232 serial adapter at each camera location. The adapter shall have a DE9 socket connector for ANSI/EIA-232 and Type A plug connector for USB. The Contractor shall also supply a 1.8 m straight through USB extension cable. The USB function shall conform to version 2.0. The Contractor shall submit the adapter software in 1 GB Secure Digital (SD) card format.

Environmental Requirements

Each CCU shall operate in an ambient temperature environment from –34 to +74 °C and up to 90 percent relative humidity. Each CCU shall pass 5 Gs, 11 ms, in any axis under non-operating conditions, MIL-E-5400T, para 3.2.24.6 shock test. Each CCU shall pass vibration tests**:**

1. Sine vibration from 5 to 60 Hz with 2.1 mm total excursion without damage.
2. Random vibration from 60 to 1,000 Hz, 5 Gs RMS (0.027-G2/Hz) without damage.

VIDEO ENCODER UNIT

General

A prototype of the video encoder unit (VEU) is not acceptable. All equipment shall be off-the-shelf production units. All equipment shall be new and not previously used. The Contractor shall provide a Service and Operation manual describing the operation, maintenance of the VEU for each unit provided in the contract. The Contractor shall provide all necessary interface cables to connect communication equipment and the camera control unit (CCU) for a complete and successful installation and operation of the VEU, and as shown on the plans.

Abbreviations

AC	Alternating Current
SNMP	Simple Network Management Protocol
TELNET	Network Virtual Terminal Protocol
CLI	Command Line Interface
NTSC	National Television System Committee
SIF	Source Input Format
QSIF	Quarter Source Input Format
CIF	Common Intermediate Format
QCIF	Quarter Common Intermediate Format
BNC	Bayonet Nut Connector
RJ	Registered Jack
IP	Internet Protocol
DHCP	Dynamic Host Configuration Protocol
bps	Bits Per Second
fps	Frame Per Second
MPEG	Motion Picture Experts Group
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
DiffServ (QoS)	DIFFerentiated SERVices (Quality Of Service)
UDP	User Datagram Protocol
RTP	Real-time Transport Protocol
RTSP	Real Time Streaming Protocol
RTCP	Real-time Transport Control Protocol
HTTP	HyperText Transfer Protocol

Physical and Mechanical Requirements

The VEU shall be mountable in a standard ANSI/EIA-310 equipment rack or can be a stand-alone unit which shall be mounted to a standard ANSI/EIA-310 equipment shelve. The VEU and shelve if any shall fit in 133.4 mm of a standard ANSI/EIA-310 equipment rack space. Each VEU shall have all the cable connections on the rear of the unit. A main power switch to turn the unit on/off shall be provided. An LED to indicate the AC power on shall be provided.

Electrical Requirements

The VEU shall be able to be remotely managed, configured and maintained without the use of any third party software with the management and performed using SNMP, TELNET and CLI. The VEU shall operate with both color and black/white video input signal without modification to the hardware.

The input video resolution of the VEU shall be the following:

Video Resolution	NTSC
SIF	352 x 240
QSIF	176 x 128
CIF	N/A
QCIF	N/A
Custom	64 x 48
Custom	128 x 96
Custom	192 x 144
Custom	256 x 192
Custom	352 x 240

The input video formats of the VEU shall be composite NTSC with 525 lines at 60 Hz. The VEU shall have a minimum of one composite video input. The input video connector shall be compatible with SMPTE 170 at 75 ohms impedance with Bayonet Nut Connector (BNC) type.

The network communication interface of the VEU shall be Ethernet 10/100 Mbps through 8P8C connector port, either in static IP or assigned through DHCP.

The camera control data interface shall include a Maintenance Serial Port for local maintenance and a Control Serial Port for Data transport. The port shall be ANSI/EIA-232 at a user selectable data rate from 1,200 to 56,000 bps, asynchronous. The connector type for the port shall be a DE9 pin type.

The VEU shall provide bandwidth for camera control within the bandwidth allocated for video only when bandwidth is needed for camera control/status data transmission.

The video compression of the VEU shall meet MPEG 4-ISO/IEC 14496-2 (1999) standard. The MPEG-4 compliant levels are:

1. Level 1 – up to 64 kbps
2. Level 2 – up to 128 kbps
3. Level 3 – up to 384 kbps

The video rates of the VEU shall be scalable from 1 fps to 30 fps and from 8 kbps to 2 Mbps. User selectable options are:

1. Constant Bit rate at Constant Frame rate
2. Variable Bit rate at Constant Frame rate
3. Constant Bit rate at Variable Frame rate

The video delivery options of the VEU are either unicast or multicast with protocols DiffServ (QoS), UDP, IP, RTP, RTSP, RTCP, HTTP, SNMP, TELNET and CLI.

Power Requirements

The VEU shall operate between the voltage range from 89 to 135 V(ac), 120 V(ac) nominal voltage and 50 or 60 Hz (±3.0 Hz). The VEU shall conform to NEMA standard TS-2 for traffic control system 2.1.2. The VEU shall meet the requirements of Section 2.1.6 "transients, power service" of the NEMA standard TS-2. The line variation and surge performance shall be tested to meet these specifications by an outside agency, other than the VEU manufacturer. The test results shall be provided upon request. The power consumption shall not exceed a total 25 watts.

Environmental Requirements

Each VEU shall operate in an ambient temperature environment from –20 to +70 °C and up to 90 percent relative humidity. Each VEU shall pass 5 Gs, 11 ms, in any axis under non-operating conditions, MIL-E-5400T, para 3.2.24.6 shock test. Each VEU shall pass vibration tests**:**

1. Sine vibration from 5 to 60 Hz with 2.1 mm total excursion without damage.
2. Random vibration from 60 to 1,000 Hz, 5 Gs RMS (0.027-G2/Hz) without damage.

EQUIPMENT SHELF WITH BRACKETS

The Contractor shall furnish and install each equipment shelf as shown on the plans.

Each shelf shall be furnished with 2 mounting brackets.

Each mounting bracket shall extend from the front to back mounting rails of the controller cabinet rack cage. Each bracket shall be designed to support a minimum of 22.7 kg. The horizontal side of each bracket shall be a minimum of 76.2 mm. Each bracket shall be attached to front and rear of the rack cage with four 10-32 stainless steel Phillips round head bolts.

Each shelf shall be fabricated of 3.2 mm cold rolled sheet or 3.2 mm aluminum sheet. Each shelf shall be the width of the control cabinet rack cage and 457 mm deep. Each shelf shall have equally distributed holes or slots throughout the shelf that shall provide 40 percent minimum open area for vertical flow-through ventilation. Each hole or slot shall not exceed 484 mm^2 in area. Each shelf shall be cadmium-plated or zinc-plated after cutting and drilling.

Each shelf shall be attached to the top of its pair of brackets in all four corners with stainless steel hardware, with the front of the shelf abutting against the front rail of the control cabinet rack cage.

HIGH MAST CAMERA INTERLOCK JUNCTION BOX

Interlock junction box (IJCB) shall be mounted inside the pole base and shall be accessible through the handhole. The IJCB shall be fabricated from 14 gauge steel sheet and hot-dipped galvanized after fabrication in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. All mounting nut and bolts shall be 6.4 mm-20 x 25.4 mm hex head stainless steel. Lock washers shall be used with each bolt. The IJCB shall consist of a main circuit breaker, a flasher transfer relay and a cable connector as shown on the plans. The flasher transfer relay shall conform to the provisions in Section 86-4.09C(6), "Dimming Relays" of the Standard Specifications.

The cable connector shall be AMP 206037-1 receptacle. The contact assignment as following:

1. Contact 12 to relay coil contact 1
2. Contact 13 to relay coil contact 2
3. Contact 15 to equipment ground
4. All other contacts not used.

The flasher transfer relay socket connector contact assignment as following:

1. Contact 1 (relay coil) to box connector contact 12
2. Contact 2 (relay coil) to box connector contact 13
3. Contact 5 (Common, Circuit No. 1) to 115 V(ac) from Main Breaker
4. Contact 7 (Normal Open, Circuit No. 1) to 115 V(ac) Winch Motor
5. All other contacts not used.

HIGH MAST CAMERA POLE ASSEMBLY

General

The Contractor shall install the following equipment for each high mast camera assembly as shown on the plans, and as specified in these special provisions:

1. Camera lowering device.
2. One high mast pole.
3. One interlock junction box (IJCB).
4. Hybrid camera cable and connectors and fittings as required.
5. High mast hybrid camera cable assembly.
6. Pole foundation.

The high mast camera pole shall have a minimum design wind velocity rating of 160 km/hr x 1.3 gust factor. Steel and concrete minimum dimensions shall not be less than shown on the standard plans.

Interlock junction box (IJCB), hybrid camera cable and connectors shall conform to the specifications described in these special provisions.

Materials

All structures shall be constructed from galvanized steel.

All materials used for construction of structural supports and foundations shall be new and conform to material requirements in the Standard Specifications and Standard Plans, unless otherwise specified in these special provisions.

Corrosion resistance shall be provided with the following methods:

1. Avoidance of contact between stainless steel and carbon steel, between different types of stainless steel (including welding material), and between aluminum and ferrous materials.
2. Utilizing continuous welding to eliminate crevices that retain moisture.
3. Minimizing welding of stainless steel.
4. Use of adequate sections and suitable materials to limit stress related corrosion.

Pole

The final detailed pole designs shall be required to show full structural integrity and shall be stamped and signed by a registered Professional Structure Engineer in the State of California. The pole design shall be submitted to the Engineer for review and approval prior to fabrication. Metal parts of steel poles and hardware shall conform to the details as shown on the plans, and as specified in these special provisions.

The poles and hardware shall be galvanized in conformance with Section 75-1.05, "Galvanizing", of the Standard Specifications. The high mast camera pole shall conform to the requirements in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Special Specifications, and these special provisions.

The pole shall include the shaft, access hole, access hole cover, support plate, anchor base and camera-lowering device. The shaft shall consist of sections of a round or multisided (16 sides) tapered steel tube with a uniform taper of 0.3 mm/m. Segment of the multisided poles shall be convex and shall have minimum bend radius of 102 mm. Steel used in fabricating the pole shall be weldable quality steel. No field welding shall be performed in the assembly of the pole. The pole shall have a reinforced access hole to allow adequate clearance for maintaining and servicing the lowering device. Access hole reinforcement shall provide a bending strength equal to that of a pole without opening. Other hardware inside the pole shall accommodate the lowering device.

The access door shall be hinged to the pole, open horizontally 180 degrees. When the access door is in the open position, it shall not interfere with access to the interior of the pole. Unless otherwise shown on the plans, the pole shall be installed with the access door towards the controller cabinet.

The pole shall be erected plumb. The vertical axis of the erected pole shall be within 76 mm of the theoretical vertical axis when measured without the action of sunlight or wind.

The pole shall conform to the requirements of the latest edition and the interim revisions of the AASHTO "Standard Specifications for the Structural Supports for Highway Signs, Luminaries and Traffic Signals." The maximum allowable wind deflection shall not exceed 183 mm under full load conditions, with a maximum wind velocity of 48 km/hr.

An embossed aluminum plate shall be attached with rivets to the outside of each pole approximately 51 mm above the access door. The nameplate shall indicate the name of the pole manufacturer, the height of the pole and the State's contract number.

Plastic laminated data sheets shall be secured on the inside of the access door, and shall include names, addresses and telephone numbers on the manufacturers of the pole, camera lowering device, and the design parameters, including wind velocity, weight, projected area and coefficient of drag for the camera lowering device with the camera unit installed.

Camera Lowering Device

The camera lowering device shall consist of a head frame, a camera ring, and an internal power drive winch. The maximum projected area of the total assembly at the top of the pole, exclusive of the camera unit, shall not exceed 2.3 m^2. The maximum weight of the head frame, camera ring and cover shall not exceed 340 kg.

The head frame shall be hot rolled steel conforming to ASTM Designation: A 36, and attached to the pole by means of slip fitter and secured by a minimum of 4 stainless steel set screws conforming to ASTM Designation: F 880, Type 304. The head frame as a minimum, shall be hot-dip in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

The head frame shall be fitted with at least 6 hoisting cable sheaves, of either galvanized or stainless steel, or aluminum, with a minimum of 127 mm pitch diameter. The head frame shall be fitted with hybrid camera cable assembly sheaves or rollers configured to provide a minimum-bending radius as specified by the hybrid camera cable manufacturer.

The hoisting cable sheaves and hybrid camera cable sheaves or rollers shall be fitted with suitable keepers to keep the cables in their tracks during pole erection and operation. The sheaves shall be supported by stainless steel shafts and shall be fitted with oil-impregnated sintered bronze bushings or roller bearings.

At least 3 hoisting cables shall be supplied. The cables shall be 4.8 mm, minimum, in diameter, 7 x 19 strand, stainless steel aircraft cable, manufactured in accordance with Military Specification: MIL-8320B.

The head frame shall be provided with a cover designed for that device and securely attached with stainless steel machine screws meeting ASTM Designation: F 593, Type 304 requirements and self-locking nuts meeting the general chemical requirements of ASTM Designation: F 594, Type 304, or a stainless steel clamp band. The shape of the lowering device and the cover shall be generally symmetrical about a vertical axis.

The camera ring shall be fabricated to 152 mm x 51 mm x No. 7 gauge spun steel and shall be hot-dipped galvanized after fabrication in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. The camera ring shall be provided with the appropriate number of 76 mm nominal steel tubes, shall be hot-dipped galvanized after fabrication in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications, to accommodate the integrated camera unit and the counterweights. The mounting arms shall be fastened to the ring with stainless steel that can be readily removed in case of a rearrangement of the integrated camera unit.

Roller-contact, spring loaded, centering arms shall be provided to center the camera ring while ascending and descending the full length of the designed travel on the pole. The arm system shall be capable of keeping the ring concentric with pole in the winds up to 48 km/hr. The rollers for the centering arms shall be of a water resistant, non-marking material. All axle shafts for arms and rollers shall be of stainless steel conforming to ASTM Designation: A 276, Type 304. The arms system shall not allow the pole to be inadvertently wedged between the rollers and the camera ring. Ultimate support of the camera ring shall not be lost by an individual or total spring failure.

Provisions shall be made for leveling the camera ring while in lowered position.

The Contractor shall level and balance the camera support ring upon installation and again before completion of the contract.

The transition assembly shall be fabricated from A36 steel. The camera ring shall be supported by three stainless steel 7 x 19 strands, 6.4 mm minimum diameter aircraft cable manufactured per MIL-8320B. Each cable shall be fitted with a stainless steel fitting which enables it to develop the full strength of the cable. The fitting shall attach to the transition assembly within the pole shaft without the use of springs. A ball bearing swivel, of sufficient size to sustain the loading on the cable, with a safety factor of four to allow the attitude of the aircraft cable to be relieved as the camera ring is raised and lowered. The lift cable shall pass up through the pole shaft, over the stainless steel head frame sheaves, to the camera ring, where they are led through guides and a compression ring and terminated with a collar-type strand vice device. The compression springs, while supporting the camera ring, are not relied upon for support of the ring in case of spring failure.

The safety mechanism shall be located in the base of the pole and consist of multi-point safety chain and hook assemblies to maintain the tension on the transition assembly, allowing the winch assembly to be disengaged. Chain and hooks shall be hot-dipped galvanized after fabrication in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. Each chain shall be secured to a plate welded to the inside of the pole shaft. The safety mechanism shall be self-contained within the pole and independent of the anchor bolt and pole foundation. Top latch units shall not be acceptable.

The internal mechanism shall be capable of raising or lowering the camera ring at an approximate speed of 3.4 m/min. The winch shall be furnished with 6.4 mm minimum diameter, 7 x 19 strand stainless steel aircraft cable, conforming to Military Specification: MIL-8320B, of sufficient length to maintain at least four wraps around the drum with the camera ring unit fully lowered position. The free end of the winch cable shall be finished with a stainless steel compression sleeve sufficient to develop 95 percent of the rated load capacity of the assembly through a ball bearing swivel of sufficient size to sustain the loading of the cable factor of four. The transition design shall be such to prevent twisting of the support cables to assure smooth winding of the cables on the winch and to prevent binding on the inside of the tower shaft. Winch cable shall wind uniformly.

The internal power drive winch unit shall include:

1. A heavy duty, totally enclosed, fan cooled, reversible universal type motor, rated at 115 V(ac) 746 W, minimum, for continuous duty, and provided with overcurrent protection.
2. An adjustable torque limiter with ball or roller bearings on all rotating shafts.
3. A remote control reversing switch (labeled "UP" and "DOWN") with minimum 6.1 m cord.
4. Worm-gear driven winch.
5. Mounting frame.
6. Other equipment as necessary.

All internal power drive winch unit components, including transformer and interlock junction box, shall be removable through the access hole for repair or replacement.

Foundation

Comply with the provisions in "Cast-In-Drilled-Hole Concrete Pile Foundations," of these special provisions.

Submittals

Submittals for the high mast camera pole assembly shall conform to the requirements in Section 86-1.03, "Equipment List and Drawings," of the Standard Specifications and these special provisions. Submittals shall be delivered to the Engineer prior to the erection of the high mast camera assembly.

The Contractor shall submit descriptive data, design working drawings, erection working drawings, calculations, and a list of materials used for the high mast camera assembly. The material list shall be complete as to the name of manufacturer, catalog number, size, capacity, finish, pertinent ratings, and identification symbols used on the plans or in the special provisions for each unit. Each submittal shall consist of 5 copies. Plans and detailed drawings shall not be larger than 558 mm x 864 mm. Each separate item submitted shall bear the descriptive title and the State's contract number.

Inspection and Testing

All equipment furnished by the Contractor shall be subject to monitoring and testing to determine conformance with all applicable requirements and to ensure proper operation of the camera lowering device prior to final acceptance of the project. Documentation as required demonstrating performance and operation in conformance to these special provisions shall be furnished by the Contractor as part of this project. All equipment required for conducting tests shall be supplied and retained by the Contractor. No separate payment will be made for the monitoring, testing, test equipment, and documentation of test results, but shall be included in the amount bid for other pay items.

The State reserves the right to examine and test any or all materials furnished by the Contractor (using the test equipment supplied by the Contractor) for this project to determine if they meet these special provisions and the Standard Specifications.

If any material used in the construction of this project is defective or otherwise unsuitable, or the workmanship does not conform to the accepted standards, the Contractor shall replace such defective parts and material at no cost to the State.

The Contractor may offer rejected equipment again for consideration provided all non-compliance has been corrected and protested by the Contractor.

The camera-lowering device shall be submitted for inspection and testing. Inspection and testing shall be performed at a site in California approved by the Engineer. Notification shall be given to the Engineer at least 10 days prior to demonstration. The times and dates of the tests shall be approved by the Engineer. The Contractor shall conduct all tests in the presence of the Engineer. Testing shall only take place on weekdays as specified in the special provisions

Prior to acceptance of the contract, a trained manufacturer's representative shall perform the operational testing of the high mast camera assembly. The testing shall consist of a minimum of 3 complete cycles of raising and lowering the camera ring (complete with the integrated camera unit connected to hybrid camera cable) the full length of its travel, as designed, within one working day. Notification shall be given to the Engineer at least 10 days prior to testing.

Documentation and Training

After the high mast camera assembly is in operation, the Contractor shall provide an instructional digital video in audio video interleave (AVI) format on a minimum 8 GB USB version 2.0 flash drive or a secure digital card, complete written instructions, and a demonstration to state personnel on the maintenance of the high mast camera assembly, including leveling of the camera ring and the procedures for the safe raising and lowering of the camera ring.

HIGH MAST HYBRID CAMERA CABLE ASSEMBLY

The high mast hybrid camera cable (HMHCC) assembly shall consist of a section of hybrid camera cable with cable connectors terminated on both. The cable shall conform to the provisions in "Hybrid Camera Cable and Connectors," of these special provisions.

The HMHCC assembly shall be continuous and with sufficient length based on the pole height denoted by the pole type as shown on the plans.

Connector AMP 206036-3 with a full set crimp contact pins and strain relief back shell, AMP 206070-1 shall be installed on the cable end toward camera control unit. Connector AMP 206037-1 with a full set crimp contact sockets and strain relief back shell, AMP 206070-1 shall be installed on the cable end toward the integrated camera unit. All connector contact shall be constructed with brass contact body material and with stainless steel spring that are sub-plated with 0.00127 mm nickel and plated with 0.00076 mm gold. Contact size shall be 16.

FIBER OPTIC TRANSMITTERS AND RECEIVERS

General

When fiber optic transmitters (FOTS) are connected to fiber optic receivers (FORS) via a fiber optic link, they shall support a minimum optical loss budget of 14 dB including system margin over a single mode fiber. The data channels shall be multiplexed and transmitted digitally with the video channel. The data channels shall support ANSI/EIA-232 full duplex with data rate capability up to 9.6 kbps. The units shall use PFM, FM, FDM, FSK and digital techniques. The result shall be high quality, crosstalk free, adjustment free operation over a wide dynamic range. There shall be no variations in the video output level due to fiber attenuation, variation because of LED aging, optical "slip rings", dynamic cable layout, or environmental factors. The units shall be optimized for single-mode 8.3/125 µm fiber operating in the 1300 nm optical window. The optical connectors shall be of the ST-compatible type.

Each transmitter and receiver shall have sync and loop back indicators in its front face panel for visual verification of bi-directional operation.

Performance Requirements

The baseband video signal output from the video/data receivers when it is receiving an optical signal from the video/data transmitters at an average power level equal to the video/data receiver sensitivity shall meet the following performance specifications defined and measured in accordance with ANSI/EIA-250 for Short Haul Transmission System for End-to-End modified performance.

Output Signal Level	as per ANSI/EIA- 250
Amplitude Vs Frequency Characteristics	as per ANSI/EIA- 250
Chrominance to Luminance Gain Inequality	as per ANSI/EIA- 250
Chrominance to Luminance Delay Inequality	as per ANSI/EIA- 250
Field Time Waveform Distortion	as per ANSI/EIA- 250
Line Time Waveform Distortion	as per ANSI/EIA- 250
Insertion Gain Variation	as per ANSI/EIA- 250
Differential Gain	as per ANSI/EIA- 250
Differential Phase	±2 degrees
Signal-to-noise ratio	50 dB weighted
Signal-to-low frequency noise ratio	as per ANSI/EIA- 250

Physical and Mechanical Requirements

Each FOTS shall have the capability of transmitting one simplex composite NTSC baseband video channel, three full duplex data channels and one bi-directional audio channel over a single-mode optical fiber. Each FOTS shall accept a composite NTSC video input as well as provide input/output for full duplex data and audio. The FOTS shall utilize cooled 1300 nm laser diodes with at least -14 dBm and the spectral line width of less than or equal to 5 nm.

Each FOTS shall have the following interfaces/provisions:

1. Video interface that shall be via a BNC connector.
2. Data channel interface that shall be via an 8-position, 8-connector modular jack (RJ45).
3. An audio interface port compatible with unbalanced and balanced 0 dBm, 600 Ω, 4 wire line. The audio interface shall be via an 8-position , 8-connection modular jack (RJ45).
4. A handset port compatible with standard telephone set equipped with carbon microphone. The handset port shall consist of a 4-position, 4-connection modular jack.

Each FORS shall have the capability of receiving one simplex composite NTSC baseband video channel, three full duplex data channels and one bi-directional audio channel from a single-mode optical fiber. Each FORS shall provide a composite NTSC video output as well as provide input/output for full duplex data and audio.

Each FORS shall have the following interfaces/provisions:

1. Video interface that shall be via a BNC connector.
2. Data interface that shall be via an 8-position, 8-connector modular jack (RJ45).
3. Each FORS shall provide an audio interface port compatible with unbalanced and balanced 0 dBm, 600 Ω, 4-wire line. The audio interface shall be via an 8-position , 8-connection modular jack (RJ45).
4. Each FORS shall provide a handset port compatible with standard telephone set equipped with carbon microphone. The handset port shall consist of a 4-position, 4-connection modular jack and shall be located on the front panel of each FORS.
5. A harness with the modular jacks and screw terminal connectors for the audio and data signals. The harness shall be fully compatible with the FDU and FORS as specified in these special provisions.

The I/O for each FORS shall correspond to the following configuration on the modular jack (RJ45) of the harness. Single ended or differential transmission shall be selected by DIP-switches on the FORS.

Standard	RJ45	DE-9	Function
ANSI/EIA-232	pin 1	pin 5	GND
	pin 2	pin 3	Tx
	pin 5	pin 2	Rx
ANSI/EIA-422	pin 1	pin 3	GND
	pin 2	pin 1	Tx+
	pin 3	pin 2	Tx-
	pin 6	pin 4	Rx+
	pin 7	pin 5	Rx-

Each FOTS shall be housed in a compact stand-alone enclosure with side flanges and shall be shelf mountable.

Each FORS shall be a chassis mount card unit which plug in to ANSI/EIA-310 rack space card cage. The unit shall permit the installation or removal of cards with the power applied without affecting other cards in the card cage.

Each FOTS shall be powered by regulated +12 V(dc) at 370 to 480 mA. An AC to DC wall mount adapter may be used for powering from 120 V(ac), 60 Hz.

The card cage for the FORS shall be powered by dual regulated 120 V(ac), 60 Hz AC to +12 V(dc) power supplies.

Environmental Requirements

Each FOTS and FORS shall be fully operational over a temperature range from -30 to +70 °C. and shall withstand a humidity range from 0 to 95 percent without condensation.

PREFORMED LOOP DETECTOR STATION

The Contractor shall install the following preformed loop detector station equipment at each station as described in these special provisions and as shown on the plans:

1. Two preformed inductive loops per traffic lane.
2. One preformed loop pull box.
3. One State-furnished Model 170 controller assembly.
4. One fiber optic data modem.

The loop shall be 1.8 m^2 unless otherwise shown on the plans. The loop shall consist of 4 turns of No. 16, or larger, wire with Type THWN or TFFN insulation.

The loop wires shall be encased in Size 10, minimum, Schedule 40 or Schedule 80 PVC or polypropylene conduit. The conduit shall be sealed to prevent the entrance of water and the movement of wires within the conduit.

The loop wires from the preformed loop to the adjacent pull box shall be twisted together into a pair (at least 7 turns per meter) and encased in Schedule 40 or Schedule 80 PVC or polypropylene conduit between the preformed loop and the adjacent pull box or detector handhole. The lead-in conduit shall be sealed to prevent the entrance of water at the pull box or handhole end.

The preformed loops shall be secured to the top of the uppermost layer of reinforcing steel within the reinforced concrete structure deck slabs, using nylon wire ties.. The loop shall be held parallel to the structure deck by using PVC or polypropylene spacers where necessary. Conduit for lead-in conductors shall be placed between the uppermost 2 layers of reinforcing steel. Lead-in conductors shall be coiled securely within the temporary enclosures with adequate slack as shown on the plans. After slabs are in place, temporary enclosures will be removed, conduit shall be installed, and the loop wire shall be routed through conduit to the preformed loop pull box. Conductors are to be terminated in the pull box and labeled as shown on the plans.

In existing pavement, preformed loop installation shall conform to the following:

1. Preformed loops and lead-in conduits shall be placed in slots, 32 mm, minimum width, cut into the existing pavement. The top of the conduit shall be 50 mm, minimum, below the top of pavement.
2. Slots in hot mix asphalt pavement shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

CHANGEABLE MESSAGE SIGN STATION

The Contractor shall furnish (except State-furnished equipment) and install the following equipment, as shown on the plans, as specified in these special provisions and as directed by the Engineer:

1. Two State-furnished Model 500 changeable message signs assemblies.
2. Two changeable message sign disconnect switches.
3. Two fiber optic data modems, in conformance with the provisions in "Fiber Optic Data Modem," of these special provisions.

State-Furnished Model 500 Changeable Message Sign System

Model 500 changeable message sign (CMS) systems consist of a Model 500 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 500 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 500 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 "Transportation Electrical Equipment Specifications, TEES" 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.

Cabinet locations are shown on the plans. The cabinets are all located on the roadway as shown on the plans.

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.

Changeable Message Sign Disconnect Switch

Each changeable message sign (CMS) shall have a disconnect switch, which shall be a UL-listed 100 A, 2-pole, non-fusible switch rated for 600 V maximum. The CMS disconnect switch shall have an electrical interlock to prevent accidental operation and a line terminal shield to prevent accidental contact with the terminals. The CMS disconnect switch shall be housed in a NEMA 3R enclosure with a door latch and provisions for a padlock. The housing shall have a front-operated handle for provisions to lock the handle in the OFF position. The housing shall be mounted on the side post on the downstream side of the pole in relation to traffic.

SERVICE MANUAL REQUIREMENTS

The Contractor shall provide to the Engineer a minimum of 5 copies of service manuals for the integrated camera unit, camera control unit (CCU), video encoder unit (VEU) and video decoder unit (VDU) under this special provisions. Each manual shall contain the following sections and sub-sections.

General Information Section

1. A list of applicable subassemblies that comprise the specified equipment.
2. Overall description of the equipment design features (including all enhance features if applicable), performance, and applications.
3. Equipment specifications summary.
4. Equipment installation instructions.

Theory of Operations Section

1. Theory of operation of the standard equipment, with unique or unusual circuitry described in detail.
2. Theory of operation reflecting any modifications to the standard equipment.

Maintenance Section

1. Recommended test equipment and fixtures, or minimum operational and performance requirements for appropriate test equipment.
2. Trouble shooting information and charts.
3. Removal and installation procedures for replacing assemblies and subassemblies, if not obvious or if improper sequencing of steps may result in component damage.

Replacement Parts Section

1. Each manual shall contain an equipment replacement parts list including electrical parts, mechanical parts and assemblies.
2. All semiconductors shall be identified by the supplier's numbers.

Diagram Section

1 Schematic diagram(s) identifying all circuit components and showing normal test voltages and levels.
2. An overall functional block diagram.
3. Detailed interconnecting diagram(s) showing wiring between modules, circuit boards and major components.
4. Pictorial circuit board layout diagram(s) showing both component placement and printed wiring detail.
5. Diagram(s) showing location of circuit boards and other subassemblies.
6. Exploded view diagram(s) of complex mechanical assemblies.

Physical Requirements

1. All pages, including latest revisions, shall be securely fastened together between protective covers (loose-leaf ring binding is acceptable).
2. No page shall be subject to fading from exposure to any normal source of ambient lighting (ozalid reproduced pages are not acceptable).

10-3.25 TRAFFIC OPERATIONS SYSTEM EQUIPMENT TESTING

Prior to shipping to the project, the Contractor shall submit the following items to the State of California, Department of Transportation Laboratory, 5900 Folsom Blvd, Sacramento, CA 95819 for acceptance testing:

1. Integrated Camera Unit
2. Camera Control Unit (CCU)
3. Video Encoder Unit (VEU)
4. High Mast Camera Lowering Device System
5. Fiber Optic Transmitter And Receiver
6. Fiber Optic data modem (FODM)

The Contractor shall deliver the equipment to the Transportation Lab and allow 30 days for testing. The Contractor shall be notified when testing is complete. The Contractor shall pick up the equipment from the test site and deliver it to the job site within 5 working days of notification of testing completion.

Any failure of the equipment that renders the unit noncompliant with these specifications will be a cause for rejection. The Contractor shall deliver replacement equipment and allow 30 days for retesting. The retesting period starts when the replacement equipment is delivered to the test site. The Contractor shall pay for all retesting costs. The Contractor shall remove rejected equipment from the test site within 5 working days of notification of rejection. Delays resulting from submittal of noncompliant materials does not relieve the Contractor from executing the contract within the allotted time.

Equipment that is not removed may be shipped to the Contractor at the Contractor's expense.

The Contractor shall pay for all shipping, handling, and transportation costs related to the testing and retesting.

10-3.26 FIBER OPTIC SYSTEM

Fiber optic system shall include furnishing and installing of fiber optic cables, fiber splice closure, fiber distribution units, fiber optic data modems, fiber optic transmitters and receivers and any other associate equipment as shown on the plans and as specified in these special provisions.

FIBER OPTIC GLOSSARY

Breakout.--The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 900 mm to 1800 mm of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting 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 (i.e., patch panel).

Connectorized.--A term that describes the termination point of a fiber after connectors have been affixed.

Connector Module Housing (CMH).--A patch panel used in the FDU to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.

Couplers.--Couplers are devices which mate two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. Couplers may also be referred to as: adapters, feed-throughs, and barrels. They are normally located within FDUs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

End-to-End Loss —The maximum permissible end-to-end system attenuation is the total loss in a given link. This loss could be the actual measured loss, or calculated using typical (or specified) values. A designer should use typical values to calculate the end-to-end loss for a proposed link. This number will determine the amount of optical power (in dB) needed to meet the System Performance Margin.

Fan Out Termination —Permits the branching of fibers contained in an optical cable into individual cables and can be done at field locations; thus, allowing the cables to be connectorized or terminated per system requirements. A kit provides pull-out protection for individual bare fibers to support termination. It provides three layers of protection consisting of a Teflon inner tube, a dielectric strength member, and an outer protective PVC jacket.

FBC.--Fiber Backbone Cable.

Fiber Distribution Unit (FDU).--A rack mountable enclosure containing both a Connector Module Housing (CMH) and a Splice Module Housing (SMH).

Fiber Storage Enclosure (FSE).--Designed for holding excess cable slack for protection. The FSE allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

F/O.--Fiber optic.

FOIP.--Fiber optic inside plant cable.

FOOP.--Fiber optic outside plant cable.

FOTP.--Fiber optic test procedure(s) as defined by EIA/TIA standards.

FPC.--Fiber Pigtail Cable

FTC.--Fiber Trunkline Cable

Light Source.--A portable fiber optic test equipment that, inconjunction 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. It also couples light from the source into the fiber to be received at the far end by the receiver.

Link.--A passive section of the system, the ends of which are connectorized. A link may include splices and couplers. For example, a video data link may be from video F/O transmitter to video F/O receiver.

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 buffer tubes to isolate them from outside forces (stress). A flooding compound or material is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.

Mid-span Access Method —Description of a procedure in which fibers from a single buffer tube are accessed and spliced to an adjoining cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

Optical Time Domain Reflectometer (OTDR).--A 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 over the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component and defects in the fiber.

Patch cord.--A short jumper used to join two Connector Module Housing (CMH) couplers, and or a CMH and an active optical electronic device.

Pigtail.--Relatively short length of fiber optic cable that is connectorized on only one end. All pigtails shall be tight buffer cable.

Power Meter.--A portable fiber optic test equipment that, when coupled 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.

Segment.--A section of fiber optic cable that is not connected to any active device and may or may not have splices per the design.

SMFO.—Singlemode Fiber Optic Cable.

Splice.--The permanent joining of fiber ends to identical or similar fibers.

Splice Enclosure.--An environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from and to multiple locations.

Splice Module Housing (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.—An underground container used to house excess cable and splice enclosures.

System Performance Margin.—A calculation of the overall "End to End" permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector). The system performance margin should be at least 6 dB. This includes the difference between the active component link loss budget, the passive cable attenuation (total fiber loss) and the total connector/splice loss.

Tight Buffer Cable.--Type of non-breakout cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900 µm with the exception of the protective thermoplastic coating. The tight buffer cable shall meet all the characteristics of the fiber in the fiber optic outside plant cable specified in these specifications.

FIBER OPTIC CABLE

GENERAL.--Each fiber optic cable for this project shall be all dielectric, gel filled, duct type, with loose buffer tubes construction with a maximum outside diameter of 14 mm and shall conform to these special provisions. Cables shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers with the numbers described below and as shown on the plans:

Type A	Fiber trunkline cable (FTC)	72 SM fibers
Type B	Fiber pigtail cable (FPC)	12 SM fibers

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 shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All F/O cable of each specific type shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall be qualified as compliant with Chapter XV11, Title 7, Part 1755.900 of the Code of Federal Regulations, "RUS Specification for Filled Fiber Optic Cables"

FIBER CHARACTERISTICS.--Each optical fiber shall be made of glass and consists 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 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 and shall be mechanically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range from -40 to +70 °C. The cable shall be tested in accordance with ANSI/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 (from -40 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:

Parameters	Characteristic
Type	Step Index
Core diameter	8.3 µm (nominal)
Cladding diameter	125 µm ±1.0 µm
Core to Cladding Offset	≤1.0 µm
Coating Diameter	250 µm ±15 µm
Cladding Non-circularity defined as: [1-(min. cladding Dia ÷max. cladding dia.)]x100	≤2.0 percent
Proof/Tensile Test	345 MPa, min.
Attenuation: At 1310 nm At 1550 nm	 ≤0.4 dB/km ≤0.4 dB/km
Attenuation at the Water Peak	≤2.1 dB/km at 1383 ±3 nm
Bandwidth: At 850 nm At 1310 nm (SM)	 N/A N/A
Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope	 From 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.--In buffer tubes containing multiple fibers, each fiber shall be distinguishable from others in the same 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)

Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors according to the following:

1. Blue (BL)
2. Orange (OR)
3. Green (GR)
4. Brown (BR)
5. Slate (SL)
6. White (WT)

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.--The fiber optic cable shall consist of, but not be limited to, the following components:

1. Buffer tubes
2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding
6. Tensile strength member
7. Ripcord
8. Outer jacket

Buffer tubes.--Clearance shall be provided in the loose buffer tubes 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. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain up to 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 shall contain a water-swellable yarn or a homogeneous hydrocarbon-based gel with anti-oxidant additives for water migration resistance. 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.

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.--Filler rods may be included in the cable to maintain the symmetry of the cable cross-section. 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 using tension sufficient 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 1 mm ±76 µm. 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 be marked with 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 900 mm static head or equivalent continuous pressure applied at one end of a 900 mm length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with ANSI/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 ANSI/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 2050 kg/m applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with ANSI/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 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 ANSI/EIA-455-41 (FOTP-41), except that the load shall be applied at the rate from 3 mm to 19 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 at the completion of the test. Outer cable jacket cracking or splitting observed under 5x magnification shall constitute failure. The test shall be conducted in accordance with ANSI/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).

Impact testing shall be conducted in accordance with ANSI/EIA-455-25 (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The average increase in attenuation for the fibers shall be ≤0.20 dB at 1550 nm. The cable jacket shall not exhibit evidence of cracking or splitting.

The finished cable shall withstand a tensile load of 2669 N without exhibiting an average increase in attenuation of greater than 0.20 dB. The test shall be conducted in accordance with ANSI/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 ANSI/EIA-455-33 (FOTP-33) procedure.

PACKAGING AND SHIPPING REQUIREMENTS.--Documentation of compliance to the required specifications shall be provided to the Engineer upon ordering the material.

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

Attention is directed to "Fiber Optic Testing," 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. Two 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 be provided to the Engineer 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.

Installation procedures and technical support information shall be furnished at the time of delivery.

FIBER CABLE INSTALLATION

Fiber optic cable shall be installed in conduit system or cable tray system as show on the plans. Fiber optic conduit system shall consist of conduits, fiber optic pull boxes and fiber optic splice vaults or cabinets.

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The Contractor shall submit to the engineer the manufacturer's recommended procedures for pulling fiber optic cable at least 20 working days prior to installing cable. Mechanical aids may be used, provided that a tension measuring device is placed in tension to the end of the cable. The tension applied shall not exceed 2.2 kilonewtons or the manufacturers recommended pulling tension, whichever is less.

The F/O cable shall be installed using a cable pulling lubricant recommended by the cable manufacture and a non-abrasive pull tape conforming to the provisions described under "Conduit" in these special provisions. Contractor's personnel shall be stationed at each pull box, vault and cabinet through which the cable is pulled to lubricate and prevent kinking or other damage.

During cable installation, the bend radius shall be maintained at not less than twenty times the outside diameter of the cable. .The cable grips for installing the fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation.

Air Blown Installation

At the Contractor's option, the fiber cable may be installed using the air blown method. If integral innerduct is used, the duct splice points or any temporary splices of innerduct used for installation must withstand a static air pressure of 758 kPa.

The fiber installation equipment must incorporate a mechanical drive unit or pusher, which feeds cable into the pressurized innerduct to provide a sufficient push force on the cable, which is coupled with the drag force created by the high-speed airflow. The unit must be equipped with controls to regulate the flow rate of compressed air entering the duct and any hydraulic or pneumatic pressure applied to the cable. It must accommodate longitudinally ribbed or smooth wall ducts from nominal from 16 mm to 51 mm inner diameter. Mid assist or cascading of equipment must be for the installation of long cable runs. The equipment must incorporate safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.

The equipment must not require the use of a piston or any other air capturing device to impose a pulling force at the front end of the cable, which also significantly restricts the free flow of air through the inner duct. It must incorporate the use of a counting device to determine the speed of the cable during installation and the length of the cable installed.

Splices During Installation

The cable shall be installed without splices except where specifically allowed on the plans or described in these special provisions. Minimum slack of the cable as shown on the plans shall be provided at each cable access location without a cable splice. At fiber optic splice location, a minimum of 9 meters slack of each cable shall be stored in the splice location.

FIBER OPTIC PULL BOX

Each fiber optic pull box shall conform to Section 86-2.06, "Pull Boxes," of the Standard Specifications for No. 6 with extensions and as shown on the plans. Cover marking shall be "CALTRANS TOS COMMUNICATION" on the cover. Pull box cover and extensions may be constructed of reinforced portland cement concrete or of non-PCC material with concrete gray color.

Conduits shall enter the fiber optic pull box through the sidewall at not more than 150 mm from the bottom of the pull box. Conduits shall not enter through the bottom of the pull box. Conduits shall not protrude more than 50 mm inside the pull box and shall enter the pull box at about 20 degrees in both the vertical and horizontal directions. Watertight sealing plugs as specified in this special provisions are required around all conduits.

FIBER OPTIC VAULT

Fiber optic vaults shall be 1.3 meter (L) x 0.86 meter (W) x 0.60 meter (D) nominal inside dimensions and shall conform to Section 86-2.06, "Pull Boxes," of the Standard Specifications. Covers shall be in one or two sections. Hold down bolts or cap screws and nuts shall be of brass, stainless steel or other non-corroding metal material. Each cover portion shall have inset lifting pull slots. Cover marking shall be "CALTRANS TOS COMMUNICATION" on the cover. Vault, cover and extensions may be constructed of reinforced portland cement concrete or of non-PCC material with concrete gray color.

Non-PCC vaults and covers shall be of sufficient rigidity that when a 45 kg concentrated point force is applied perpendicularly to the midpoint of one of the long sides at the top while the opposite long side is supported by a rigid surface, it shall be possible to remove the cover without the use of tools. When a vertical force of 6.6 kN is applied, through a 12 mm x 76 mm x 150 mm steel plate, to a non-PCC cover in place on a splice vault, the cover shall not fail and shall not deflect more than 6 mm.

Fiber optic vaults shall be installed as detailed and as shown on the plans. All fiber optic vaults and covers shall have an AASHTO HS 20-44 rating. Fiber optic vaults shall be installed at grade. Metallic or non-metallic cable racks shall be installed on the interior of both long sides of the fiber optic vaults. The racks shall be capable of supporting a load of 37 kg, minimum, per rack arm. Racks shall be supplied in lengths appropriate to the box in which they will be placed. All metallic cable racks shall be fabricated from ASTM Designation: A36 steel plate and shall be hot-dip galvanized after fabrication. Steel plate, hardware and galvanizing shall be in accordance with the requirements of Section 75, "Miscellaneous Metal," of the Standard Specifications. Metallic cable racks shall be bonded and grounded.

Unless otherwise shown on the plans or as directed by the engineer, vaults shall be located outside the pavement with the lid centerline 1.5 m from the edge of the pavement or back of the dike. Vaults may be moved farther from the roadway to accommodate buried objects, existing conduits, or similar items that prevent installation 1.5 m from the pavement, but no part of the vault, concrete encasement ring, or backfill material shall be less than 450 mm from the edge of the pavement or back of the dike, to allow for future electrical conduit installations between the vault and roadway. The top of the vault lid shall match the final grade within 25 mm ±12 mm.

Some locations along the roadway may have existing conduits, pipes, or drains parallel to the roadway and next to the shoulder, which may make it impossible to route conduits to the vault. At other locations, buried objects, steep drop-offs, or other object may make installation of a vault outside the pavement impossible. At these locations or as directed by the engineer, vaults may be installed in the pavement of the shoulder or in the pavement of chain on/off areas. Vaults placed inside the pavement shall be installed with the centerline of the vault not more 1 meter from the edge of pavement or back of dike, and with the entire top of vault lid 25 mm ±12 mm below the surface of the pavement, when all pavement work specified in the job is completed.

Vaults located at bridges where exposed conduit must be used, such as at undercrossings, shall be located as close as possible to the end of the structure unless otherwise specified on the plans, If not specified otherwise in the plans, the location of vaults at bridge structures shall be between the first and second guardrail posts. Unless otherwise directed by the engineer, the top of the vault lid at these locations shall be located entirely behind the guardrail and shall conform to the final grade of the surrounding fill at the vault location. No part of the vault or vault lid shall be exposed or extend past the edge of the hinge point for the bridge, or otherwise deform the earth fill at the vault location.

Conduits shall enter the fiber optic vault through the sidewall at not more than 150 mm from the bottom of the vault. Conduits shall not enter through the bottom of the vault. Conduits shall not protrude more than 50 mm inside the pull box and shall enter the vault at about 20 degrees in both the vertical and horizontal directions. Watertight sealing plugs as specified in this special provisions are required around all conduits.

CONDUIT SEALING PLUGS

Except otherwise noted, all fiber optic conduits shall have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into these conduits.

Sealing plugs shall be removable and reusable. Plugs shall be the split type that permits installation or removal without removing cables. Sealing plugs shall seal the conduit 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.

To provide suitable sealing between future varying size cables and the plugs, split neoprene or silicone adapting sleeves, used singularly or in multiples, shall be inserted within the body of the plugs. Sealing plugs used to seal the fiber optic conduit shall be capable of withstanding a pressure of 34 kPa. 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 that the pull rope will be easily accessible when the plug is removed.

WARNING TAPE

Warning tape must be furnished, installed and placed in the trench over new conduits to receive new fiber optic cable as shown on in the plans.

The warning tape must have:

Description	Parameters
Thickness	not be less than 0.1 mm thick
Width	100 mm
Material	Orange color polyolefin film
Tensile strength (2800 psi)	Minimum of 19.3 MPa
Elongation	minimum of 700 percent elongation before breakage
Printed Text height	25 mm black color
Message background color	bright orange color background
Message statement	CAUTION: BURIED FIBER OPTIC CABLE - CALTRANS RADIO ROOM (510) 286-6359
Message spacing intervals	approximately every 1 meter

The printed warning must not be removed by the normal handling and burial of the tape and must be rated to last the service life of the tape.

The construction of the warning tape must be such that it will not delaminate when it is wet. It must be resistant to insects, acid, alkaline and other corrosive elements in the soil.

Warning tape shall be manufactured by Condux International, Inc.; Allen System, Inc.; Reef Industries, Inc. or equal.

TRUNKLINE SPLICE CABINET

The trunkline splice cabinet (TSC) shall be a Type P cabinet. The Contractor shall construct each TSC foundation as shown on Standard Plan ES-3C including furnishing and installing anchor bolts, shall install the cabinet on the foundation, shall furnish and install fiber optic splice closure, cable retainer and shall make all cable breakout and field splice connections in the cabinet as shown on plans.

CABLE SPLICING

Field cable splices shall be done either in splice vaults or in cabinets as shown on the plans.

Unless otherwise allowed, the 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 mid-span access method shall be used to access the individual fibers in a cable for splicing to another cable as shown on the plans. Cable manufacturers recommended procedures and approved tools shall be used when performing a mid-span access. Only the fibers to be spliced may be cut. All measures shall be taken to avoid damaging buffer tubes and individual fibers including those not being used in the mid-span access.

The mid-span access method shall be used to access the individual fibers in the trunkline cable for splicing pigtail cable. The Contractor will be allowed to splice up to 5 fibers to repair any damage done during mid-span access splicing without penalty. For each additional splice the Contractor will be assessed $300.00. Any single fiber may not have more than 3 unplanned splices. If the fiber needs to be spliced more than 3 times, the entire length of fiber optic cable must be replaced at the Contractor's expense.

The field splices shall connect the fibers of the two cable lengths together. These splices shall be placed in splice trays and these splice trays shall then be placed in the splice enclosure.

The termination splices shall connect the cable span ends with pigtails. The termination splices shall be placed in splice trays and the splice trays shall then be placed in the fiber distribution unit (FDU).

Splice trays must accommodate a minimum of 12 fusion splices. The individual fibers shall be looped at least 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 discernable tensile force on the optical fiber.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

FIBER OPTIC SPLICE CLOSURE

Fiber optic cable field splices shall be enclosed in splice closures which shall be waterproof, rodent proof and re-enterable. The fiber optic splice closure shall be suitable for a temperature range from 0 to 50 °C.

The fiber optic splice closure shall consist of an outer closure, an inner closure and complete with splice organizer trays, brackets, plugs, clips, cable ties and sealants as needed and shall conform to the following special provisions.

The size of the closure shall allow all the fibers of the largest fiber optic trunk cable or buffer tube to be spliced to a second cable or buffer tube of the same size, plus fibers from fiber optic pigtail cable. The closure shall be not more than 914 mm in length and not more than 200 mm in diameter.

All materials in the closures shall be nonreactive and shall not support galvanic cell action. The outer-closure shall be compatible with the other closure components, the inner closure, splice trays, and cables.

The end plate shall consist of two sections and shall have capacity for two fiber optic trunk cables and fiber optic branch cables.

The outer-closure shall protect the splices from mechanical damage, shall provide strain relief for the cable, and shall be resistant to salt corrosion.

The outer-closure shall be waterproof, re-enterable and shall be sealed with a gasket. The outer-closure shall be flash-tested at 103 kPa.

The inner-closure shall be of metallic construction. The inner-closure shall be compatible with the outer closure and the splice trays and shall allow access to and removal of individual splice trays. The splice trays shall be compatible with the inner closure and shall be constructed of rigid plastic or metal.

Adequate splice trays shall be provided to splice all fibers of the largest communication cable or buffer tube plus FPC in the splice cabinet.

Vinyl markers shall be used to identify each spliced fiber in the trays as described under "Fiber Optic Cable Labeling" in these special provisions.

Each splice shall be individually mounted and mechanically protected in the splice tray.

The Contractor shall install the fiber splice enclosure in the splice vault or cabinet as shown on the plans where splicing is required. The Contractor shall provide all mounting hardware required to securely mount the fiber optic splice enclosures to the splice vault or cabinet.

The fiber splice enclosure shall be mounted as shown on the plans in a manner that allows the cables to enter at the end of the enclosure. Not less than 9 meters of each cable (2 or 3) shall be coiled in the splice vault or cabinet to allow the fiber splice enclosure to be removed for future splicing.

The unprotected fibers exposed for splicing within the enclosure shall be protected from mechanical damage using the fiber support tube or tubes and shall be secured within the fiber splice enclosure.

Upon completion of the splices, the splice trays shall be secured to the inner closure.

The closure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant shall be injected between the inner and outer closures.

Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is not acceptable to have multiple cables enter the fiber splice closure through one hole.

FIBER OPTIC CABLE TERMINATIONS

DISTRIBUTION BREAKOUT.--The jacketed cable shall be lashed with tie wraps to the rack prior to entering the FDU. The cable shall also be tie-wrapped to the inside of the FDU near the point of entry. The glass fibers shall not be damaged during cutting and removal of the buffer tubes.

The jacketed area and bare fibers shall be cleaned to remove the moisture blocking gel. The transition from the buffer tube to the bundle of jacketed fibers shall be treated by an accepted procedure for sleeve tubing, shrink tubing and silicone blocking of the transition to prevent future gel leak. A subsequent transition shall be made, with flexible tubing, to isolate the fiber bundles of each buffer tube to serve as a transition from the bundle to the separation point and to protect the individual coated fibers. The last transition point (bundle to single fiber) shall consist of inserting the individual fibers into No. 26 AWG clear teflon tubing, to protect the fiber as it is routed toward the splice tray and to allow clear color identification of fibers for proper distribution. The final transition from bundle to individual fiber tube shall be secured with an adhesive heat shrink sleeve. The individual fibers shall then be stripped and prepared for splicing.

All fibers inside a fiber optic cable entering a FDU shall be properly terminated, whether they are used or not

DISTRIBUTION INTERCONNECT PACKAGE.--Distribution involves connecting the fibers to the active electronic components. The distribution equipment consists of FDUs with connector panels, couplers, splice trays, fiber optic pigtails and cable assemblies with connectors. The distribution interconnect package shall be assembled and tested by a company who is regularly engaged in the assembly of these packages. Attention is directed to "Fiber Optic Testing" in these special provisions. All distribution components shall be products of the same manufacturers, who are regularly engaged in the production of these components, and the respective manufacturers shall have quality assurance programs.

FIBER OPTIC CABLE ASSEMBLIES AND PIGTAILS

General.--Cable assemblies and pigtails shall be products of the same manufacturer. The cable used for cable assemblies and pigtails shall be made of fiber meeting the performance requirements of these special provisions for the F/O cable being connected.

Pigtails.--Pigtails shall be of simplex (one fiber) construction, in 900 μm tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information and a normal outer jacket with diameter of 3 mm. Singlemode cable jackets shall be yellow in color. All pigtails shall be factory terminated and tested and at least 900 mm in length.

Patch cords.—Patch cords may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction, and shall not have zipcord (siamese) construction. The patch cord shall be terminated with ST compatible super physical contact singlemode connector at both ends. The fiber strands shall meet the specifications as those of the fiber cable and the connectors shall meet the specifications as specified in these special provisions. All patch cords shall be at least 2 meters in length, sufficient to avoid stress and orderly routing.

The outer jacket of duplex patch cords shall be colored yellow. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity.

Connectors.--Connectors shall be of the ceramic ferrule ST "push-pull" type. Indoor ST connector housings shall be either nickel plated zinc or glass reinforced polymer construction. Outdoor connector body housing shall be glass reinforced polymer.

The associated coupler shall be same material as the connector housing.

All F/O connectors shall be 2.5 mm ST connector ferrule type with Zirconia Ceramic material with a physical contact pre-radii used tip.

The ST connector operating temperature range shall be from -40 °C to +70 °C. Insertion loss shall not exceed 0.4 dB and the return reflection loss on singlemode connectors shall be at least 40 dB. Connection durability shall be less than 0.2 dB change per 500 mating cycles per ANSI/EIA-455-21A (FOTP-21). All terminations shall provide a minimum 220 Newton pull out strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors. Singlemode connectors shall have a yellow color on the body or the boot.

Field terminations shall be limited to splicing of adjoining cable ends or cables to ST pigtails.

ST Couplers.-The ST couplers shall be made of nickel plated zinc or glass reinforced polymer that is consistent with the material forming the associated ST connector body. The design mechanism for mounting the coupler to FDU connector module panel may be flanged or threaded but shall coincide with FDU panel punch-outs.

All coupler sleeves shall be ceramic of the split clamshell or clover leaf design.

The temperature range for the couplers shall be the same as that specified for the ST connectors.

FIBER OPTIC DISTRIBUTION UNIT

Fiber distribution unit (FDU) shall be ANSI/EIA-310 standard mount type as shown on the plans.

FDU shall consist of a connector module housing (CMH) and a splice module housing (SMH). The CMH shall have sufficient number of connection panels to handle the associated fiber terminations. The SMH shall have the capacity to secure and store the required splice trays and break out cables.

Connector module housing (CMH) shall have a Lexan front cover so as not expose fiber optic connections. Each connection panel shall have six coupler capacity and all panel positions shall be filled with couplers. All spare couplers shall have dust covers on both sides. Each connection panel shall be secured to the CMH frame with two plastic puch snap fastener on each side of the panel.

Splice module housing (SMH) shall have sufficient number of splice trays to handle the transition splices between the field cables and their respective breakouts. Cable accesses to the SMH shall have grommets. SMH shall have a rear metal cover of the same gauge and color as the remainder of the FDU rack

The front and back covers of the FDU shall be retractable or removable to facilitate internal installation.

FIBER OPTIC LABELING

General

The Contractor shall label all fiber optic and copper communications cabling in a permanent consistent manner. All tags shall be of a material designed for long term permanent labeling of fiber optic and copper communications cables and shall be marked with permanent ink on non-metal types, or embossed lettering on metal tags. Metal tags shall be constructed of stainless steel. Non-metal label materials shall be approved by the Engineer. Labels shall be affixed to the cable per the manufacturer's recommendations and shall not be affixed in a manner which will cause damage to the fiber. Handwritten labels shall not be allowed.

Label Identification

Labeling of Cables.--Labeling of the backbone, distribution and drop fiber optic cables shall conform to the following unique identification code elements:

Labeling Schemes

Unique Identification Code Elements for Backbone, Distribution or Drop Cables

No.	Description	Code	Number of Characteristics
1	Cable Type	Fiber: S: Singlemode	1
2	Fiber Count	Number of fibers or conductor pairs (example: 72 fibers)	3
3	Begin Function	T: TMC; H: Hub; V: Video Node; D: Data Node; C: Cable Node; TV: CCTV Camera; CM: CMS; E: Traffic Signal; RM: Ramp Meter; TM: Traffic Monitoring/Count Station/Vehicle Count Station (VDS, TMS); SV: Splice Vault SC: Splice Cabinet	1 or 2
4	County	County Number; Example: 033 (for Alameda)	3
5	Route Number	Hwy, Rte (example: 005)	3
6	Post Mile	Example: xxxxx	5
7	End Function	T: TMC; H: Hub; V: Video Node; D: Data Node; C: Cable Node; TV: CCTV Camera; CM: CMS; E: Traffic Signal; RM: Ramp Meter; TM: Traffic Monitoring/Count Station/Vehicle Count Station (VDS, TMS); SV: Splice Vault SC: Splice Cabinet	1 or 2
8	County	County Number; Example: 034 (for Sacramento)	3
9	Route Number	Hwy, Rte (example: 005)	3
10	Post Mile	Example: xxxxx	5
11	Unique ID	Identifies when two or more fiber cables are involved (example: xx)	2

Caltrans District 4 county system numbers are as following:

County	County System Number
Alameda	33
Contra Costa	28
Marin	27
Napa	21
San Francisco	34
San Mateo	35
Santa Clara	37
Santa Cruz	36
Sonoma	20
Solano	23

Example: S 048 SV 033 080 00569 SV 033 080 00610 03.

The label in the example can be translated as a singlemode (S) 48 strand cable (048) that starts from a splice vault (SV) in Alameda County (033) on I-80 (080) post mile 5.69 (00569) ends at another splice vault (SV) in Alameda County (033) on I-80 (080) at post mile 6.10 (00610). This fiber optic cable is uniquely identified as 03. This means the cable is the 3rd of the fiber optic cables in the pull box or the vault.

Each cable shall display a unique identification, regardless of where the cable is viewed. The begin function and end function correspond to the end points of each cable. The order of the begin and end function follow a hierarchy as listed below, where the lowest number corresponding to the begin/end function is listed first.

1	TMC
2	HUB
3	Video Node (VN)
4	Data Node (DN)
5	Cable Node
6	CCTV Camera
7	CMS
8	Traffic Signal
9	Ramp Meter
10	Traffic Monitoring Count Station
11	HAR
12	EMS
13	Weather Station
14	Weight In Motion
15	Splice Vault or Cabinet

This scheme will work as follows:

A cable between the TMC and a HUB will always have the TMC listed as the start function and the HUB as the end function. Between a CMS and a Splice Vault, the start function will always be listed as the CMS, and so on. If a cable is connected between HUBs, for example HUB-01 and HUB-03, the lowest number, in this case HUB-01, will be listed as the start function and HUB-03 as the end function.

At each FDU or ITU the Contractor shall provide a listing of the cable or cables terminated and where each fiber appears on the connector panel, a list of all jumpers and the equipment that they are connected to, and a geographical layout of all the equipment installed by the Contractor. In field cabinets these shall be placed in a waterproof pouch mounted on the cabinet door.

Label Placement

Abbreviations:

TMC	Txxx.xx
HUB	Hxxx.xx
VAULT	SVxxx.xx
PULL BOX	PBxxx.xx
CAMERA	TVxxx.xx
CMS	CMxxx.xx
TMS	TMxxx.xx
RAMP METER	RMxxx.xx
TRAFFIC SIGNAL	Exxx.xx
HAR	HRxxx.xx
EMS	FMxxx.xx
WEATHER STATION	WSxxx.xx
WEIGHT IN MOTION	WTxxx.xx

The x's denote the post mile of the above elements.

Cables.--All cables shall be clearly labeled with the unique identification code element method described in these special provisions, at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

Cable to Cable Splices.--All cable jackets entering the splice enclosure shall be labeled in accordance with the identification method described in these special provisions.

Cable to Fiber Distribution Units.--The cable jackets shall be clearly labeled at entry to the FDU in accordance with the unique identification code element method described in these special provisions. In addition, each fiber and pigtail shall be labeled at the connector with the Fiber ID. The FDU shall be clearly labeled with the Cable ID on the face of the FDU. If multiple cables are connected to the FDU, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the FDU in the designated area with the Fiber ID.

Fiber.--Fibers labels shall be placed next to the connectors of the individual fibers.

Patch Panels.--The cable jackets shall be clearly labeled at entry to the Patch Panel in accordance with the unique identification code element method described in these special provisions. In addition, each fiber and pigtail shall be labeled at the connector with the Fiber ID. The Patch panel shall be clearly labeled with the Cable ID on the face of the Panel. If multiple cables are connected to the Patch Panel, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the Panel in the designated area with the Fiber ID.

Splice Trays.--A label shall be placed on each splice tray explaining the splices in each tray.

FIBER OPTIC DATA MODEM

The fiber optic data modem (FODM) shall be ANSI/EIA-232 compatible fiber optic modem with dual optics for drop/insert capability which can be configured as master or local(slave) in either daisy chain or fault tolerant dual redundant (counter rotating) ring network architecture. These four modes of operations shall be selectable via an external Mode DIP-switch. All signals received via an optical port and retransmitted via fiber or via an expansion port shall be retimed to 0.01 percent pulse width accuracy by a crystal controlled time base, eliminating pulse width distortion and eliminating virtually unlimited repeating. The FODMs shall have anti-streaming circuitry for both the optical fiber and the electrical (ANSI/EIA-232) sides. On ANSI/EIA-232 side, when enabled, the anti-streaming shall limit the amount of time an external device is allowed to transmit data onto the network for each Request to Send (poll). On the fiber side, the anti-streaming shall disable an optical receiver in the event that the receiver output stays high longer than maximum allowable time thus preventing the whole fiber network from being disabled by a continuous "on" failure by receiver or optical emitter. External (TIMEOUT) DIP-switch shall allow user to disable or select the timeouts for both the optical side anti-streaming feature and the ANSI/EIA-232 side anti-streaming feature as well as to enable or disable the "Fiber Activity CTS Disable" feature. LED indicators to display power "on", anti-streaming "Fault" time-out and ANSI/EIA-232 fiber optic activity (selectable via dual function switch).

The FODMs at the field element shall be stand-alone type and shall be securely fastened on a ANSI/EIA-310 rack-mount shelf. At the hub location, the FODMs shall be rack-mount type installed in card cage assembly. The card cage assembly shall be ANSI/EIA-310 rack mount type with at least 14 slots and with two power supplies for redundancy.

The FODM shall meet the following requirements:

Electrical Signaling:	ANSI/EIA-232 with full handshake control signals
Electrical Power:	115 V(ac), 60 Hz
Operating Temperature	From -40 to 70 °C
Operating Mode:	1. Daisy chain Master mode 2. Daisy chain Local mode 3. Fault tolerant Master mode 4. Fault tolerant Local mode
Emitter type:	Laser
Wavelength	1310 nm
Minimum coupled transmit power into: 9/125 μm at 25 °C	-11(-9.5) dBm
Output Variation	-0.015 dB/°C
Minimum receiver input power for 10^{-9} BER	-40 dBm
Maximum receiver input	-11 dBm
Optical port type	ST
ANSI/EIA -232 connector type	DE9 female
Data Rates (auto)	From 1200 baud to 57.6 kbaud
Bit Error Rate:	10^{-9}
Link Budget(Range) via singlemode 1310 nm	31 dB for (56 km)

FODMs shall be tested as follows:

1. Each optical modem shall be functionally tested by looping back optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss at 31 dB at 1310 nm. A test set shall be connected to the modem and set for ANSI/EIA-232 communication testing. Fifteen minutes BER test burn-in test shall be error free.
2. After performing the 15 minutes BER test, at least two modems shall be tested for receiver dynamic range. The following procedure shall be followed: First, the optical attenuation shall be increased to the point at which the data test just begins to register bit errors. The optical receive power into the modem shall be measured and recorded. The optical attenuation shall be then decreased until data test once again register errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level. The optical receive levels shall once again be measured and recorded. These minimum and maximum receiver power levels define modem receiver's dynamic range and shall meet or exceed the manufacturer's specifications.
3. One pair of modem shall be interconnected using optical patch cords and attenuators with a loss of 31 dB in each direction. The ANSI/EIA-232 interface shall be looped back onto one modem and a test set connected to the ANSI/EIA-232 interface of the other modem. A bit error rate of less than 10^{-9} shall be demonstrated.

10-3.27 HUB EQUIPMENT

Hub equipment shall conform to the Federal Communications Commission (FCC) rules and regulations, and these special provisions.

Prototype equipment is not acceptable. All equipment shall be current standard production units and shall have been in use for a minimum of 6 months. Rebuilt or reconditioned equipment will not be allowed. All rack mounted equipment and card cage assemblies shall have metal filler plates to cover any unused channel slots or card slots.

The communication equipment shall include associated power supplies and interconnect cables.

The communication equipment shall be designed for testing, monitoring, and adjustment without service interruption.

Front access shall be provided for all routine adjustments normally required to be performed by field personnel.

The Contractor shall install hub equipment, at locations shown on the plans with the following equipment, associated cable connectors and other necessary components for a functional and fully integrated system:

1. 4 - Switch ethernet hub.
2. 20 - Fiber optic data modems (FODM) with 3- Card cage assembly with power supply.
3. 20 - Video encoder units (VEU).
4. 2 - Fiber distribution units (FDU).
5. 2 - Fiber storage enclosures (FSE).
6. 20 – Fiber Optic Receivers (FORS) units with 3 - Card cage assemblies with power supplies.
7. 3 - Card cage assemblies with two power supplies each.
8. 10 - Power strips.

10-3.28 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, (3) after installation but prior to connection to any other portion of the system, and (4) during final system testing. The active components shall be tested after installation.

Documentation of all test results shall be provided to the Engineer within 5 working days after the test involved. The Contractors attention is directed to "As-Built Plans" in these special provisions, regarding the requirements for recording test results.

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 include the tests involved and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, date and operating procedures.

FACTORY TESTING

Documentation of compliance with the fiber specifications as listed in the Fiber Characteristics Table shall be supplied by the original 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 (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor.

ARRIVAL ON SITE

The cable and reel shall be physically inspected on delivery and 100 percent of the fibers shall be attenuation tested to confirm that the cable meets requirements. Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Singlemode fibers (SM) shall be tested at 1310 nm and at 1550 nm.

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.

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 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 FO 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 fiber optic 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.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Singlemode fibers (SM) shall be tested at 1310 nm and at 1550 nm. Attenuation readings shall be recorded on a cable data sheet showing factory and after installation results.

The OTDR shall have a printer capable of producing a verifying test trace with fiber identification as shown in Appendix A "Link Loss Budget Work Sheet," numerical loss values, the date and the operator's name. The Contractor to submit test results to the Engineer in a minimum of 1 GB Secure Digital (SD) card or USB flash drive.

FIBER OPTIC SYSTEM GAIN MARGIN

The installed system gain margin shall be at least 6 dB for each and every link. If the design system gain margin is less than 6 dB, the Engineer shall be notified and informed of the Contractor's plan to meet that requirement. Test results shall be recorded and submitted to the Engineer for approval.

INTERCONNECTING PARTS TESTING AND DOCUMENTATION

All the components of the passive interconnecting parts (FDUs, pigtails, couplers and splice trays) shall be from a manufacturer who is regularly engaged in the production of the fiber optic components described.

Each ST termination shall be tested for insertion attenuation loss with the use of an optical power meter and 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 interconnecting assembly is complete, the contractor shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the contractor 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 contractor's 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.

ACTIVE COMPONENT TESTING

The transmitters and receivers shall be tested with a power meter and light source, to record the transmitter average output power in (dBm) and receiver sensitivity in (dBm). These values shall be recorded in the "Link Loss Budget Work Sheet" shown in Appendix A.

SYSTEM VERIFICATION AT COMPLETION

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 at both wavelengths. Test results shall be recorded, dated, compared and filed with previous copies. A hard copy printout and a electronic copy of the traces and test results along with a licensed copy of the associated software on a minimum 4 GB USB version 2.0 flash drive or a Secure Digital card 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.

The "Link Loss Budget Work Sheet" shown in Appendix A shall be completed for each link in the fiber optic system, using the data gathered throughout the installation process. The completed work sheets shall be included as part of the system documentation in the As-Built Plans.

The "Total System Gain" shall be calculated by subtracting the measured "Optical Receiver Sensitivity" (line 1B on the "Link Loss Budget Work Sheet") from the measured "Optical Transmitter Average Power" (line 1A), which were obtained using a power meter and source. The resulting difference shall be the maximum allowable loss between the transmitter and the receiver, within 0 percent to +10 percent of the manufacturers specified loss budget for the transmitter/receiver pair. The "Total System Gain" shall be recorded on line 1C.

The "Fiber Losses" for a link shall be calculated by multiplying the length of the fiber link (line 2A) by the normalized cable attenuation (dB/km, line 2B) at the operating wavelength. The normalized attenuation for this calculation shall be the maximum value throughout the operating temperature range of the cable. The product shall be recorded on line 2C.

The total connector losses shall be calculated by summing the individual attenuation values for each connector pair in the link, excluding the transmitter and receiver connectors. The sum shall be recorded on line 2D.

The total splice losses shall be calculated by summing the individual attenuation values for each splice in the link. The sum shall be recorded on line 2E.

The total of other losses shall be calculated by summing the individual attenuation values for each component in the link not previously addressed. The sum shall be recorded on line 2F. These items may include, but are not limited to, couplers, splitters, routers and switches.

The "Total System Loss" shall be recorded on line 2G of the "Link Loss Budget Work Sheet."

The "Design System Gain Margin" shall be calculated by subtracting the Total System Loss (line 2G) from the Total System Gain (line 1C). The resulting difference shall be recorded on line 3A. The Contractor's attention is directed to "F/O System Gain Margin," in these special provisions.

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 ANSI/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.

If during any of these system verification tests, the results prove to be unsatisfactory, the F/O cable will not be accepted. The unsatisfactory segments of cable shall be replaced with a new segment of cable at the Contractor's expense. The new segment of cable shall undergo the same testing procedure 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 a splice and a connector.

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 nm1550 nm

Section 1: Total System Gain

Measured Optical Transmitter Average Power:	_____	dBm	1A
Measured Optical Receiver Sensitivity (this should be a negative value):	_____	dBm	1B
Subtract line 1B from 1A to obtain Total System Gain:	_____	dB	1C

Section 2: Total System Loss

Measured length of the link:	_____	km	2A
Measured loss per km of the fiber:	_____	dB/km	2B
Multiply line 2A by 2B to obtain the Total Fiber Loss:	_____	dB	2C
Sum of all Connector Losses in the link:	_____	dB	2D
Sum of all Splice Losses in the link:	_____	dB	2E
Sum of all Other Losses from other components (couplers, splitters, routers, switches, etc.)	_____	dB	2F
Add lines 2C, 2D, 2E and 2F to obtain Total System Loss:	_____	dB	2G

Section 3: Design System Gain Margin

Subtract line 2G from line 1C (This number must be at least 6 dB):	_____	dB	3A

10-3.29 ELECTRICAL EQUIPMENT

UTILITY PANELS

The utility panel shall conform to the following requirements and as shown on the plans.

The panels and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI and NEMA.

Enclosure

The enclosure shall have the following features:

1. Shall measure 762 mm Wide x 1524 mm High x 457 mm Deep and be fabricated from 304D stainless steel.
2. Internal parts shall be fabricated from 14 gauge cold rolled steel.
3. Cabinet shall be all welded construction with welding materials specifically designed for the material used.
4. All fasteners, latches, and hardware shall be of stainless steel and all hinges shall be continuous piano style.
5. Shall have hinged dead front with 1/4 turn latch and knurled knobs.
6. Dead front door shall be hinged on the same side as exterior door and open a minimum of 100 degrees.
7. All bussing shall be UL approved copper THHN cable bussing, fully rated.
8. There shall be no exposed nuts, bolts, screws, rivets, or other fasteners on the exterior.
9. Cabinet shall have an enclosed swept pull section.
10. The removable back pan shall be mounted on 4 welded 6 mm studs. Cabinet doors shall have a 3 point pad-lockable latch system.
11. Cabinets shall have fully framed side hinged outer doors with top drip lip and closed cell neoprene flange compressed gaskets.
12. All circuit breakers shall be mounted in a vertical position, handle up for "ON", and handle down for "OFF".
13. Circuit breakers shall be of cable-in, cable-out type.
14. The function of all circuit breakers, switches, and other components as required shall be identified by laminated engraved plastic nameplates with minimum 6 mm letters fastened with a minimum of two No. 4-40 stainless steel machine screws.
15. Service enclosure shall be completely pre-wired in the factory.

Transformer

General Requirements:

1. Transformers shall be designed and manufactured in compliance with NEMA ST-20 and UL 1561.
2. Transformers shall be capable of operating at 100 percent of nameplate rating continuously while in an ambient temperature of 40 ^{o}C.
3. Transformer insulation materials shall be fire retardant and shall not support combustion in conformance with requirements in ASTM D 635.
4. Transformer windings shall be aluminum.
5. Transformer sound levels shall not exceed 45 db.
6. Transformer core and coil assembly shall be grounded to the transformer enclosure by means of a flexible copper grounding strap.

Transformer Construction:

Transformer core shall be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below core saturation point. The core and coil assembly shall be impregnated with non-hygroscopic, thermosetting varnish to reduce hot spots and seal out moisture. Transformer core shall be clamped using insulated bolts through the core laminations to provide consistent pressure throughout the core length. Completed core and coil shall be bolted to enclosure base and isolated from base by rubber vibration-absorbing mounts. The transformer shall meet the following:

1. Transformer insulation type shall be as follows:

   1.1. Less than 15 kVA: 185 ºC insulation system with maximum 115 ºC rise.
   1.2. 15 kVA and above: 220 ºC insulation system with maximum 115 ºC rise.

2. Transformers shall conform to NEMA TP-1 requirements for energy efficiency and be Energy-Star listed.
3. The transformer shall include two 2-1/2 percent taps below and above nominal voltage.

Ratings

Voltage ratings shall be as shown on the plans. Panels shall be designed for continuous operation at rated kVA with normal life expectancy as defined in ANSI C57.96.

Circuit Breaker Type B

1. The circuit breaker Type B shall be a molded case circuit breaker providing complete circuit overcurrent protection by having inverse time and instantaneous tripping characteristics and shall be designed, manufactured, assembled and tested in accordance with UL 489 and NEMA AB-1 Standards. The frame rating and settings shall be as shown on the plans.
2. The molded case circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip free from the toggle handle so that the contacts cannot be held closed against short circuits and abnormal currents. All poles shall be so constructed that contacts open, close and trip simultaneously in the either ON or OFF position. All breaker covers shall have molded-in "ON" and "OFF" position.
3. The circuit breaker frames shall employ high strength, molded-polyester, glass-reinforced cases and covers. The breaker frame shall have legible, tamper-proof nameplates containing maximum frame ampere ratings, maximum voltage ratings and interrupting ratings in accordance with UL standards. All breaker frames sizes shall have external means for manually tripping the breaker and exercising the mechanism and trip latch member.
4. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of arc chutes.
5. The circuit breaker rating shall be as specified on the plans and as required by the load and coordination studies.
6. Ground fault protection shall be provided where indicated. Shunt trips and auxiliary switches shall be provided where shown on the plans.

Qualifications

For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified. The manufacturer of this equipment shall have produced similar electrical equipment. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided.

Submittals

Submittal package shall consist of six copies. Submittals shall be delivered to the Engineer at least 180 days prior to the start of the installation. The Engineer shall be allowed 90 days for review of the submittals. The following information shall be submitted to the Engineer:

1. Dimension drawing and weight.
2. Technical certification sheet.
3. Transformer ratings.
4. Component ratings.

SAFETY SWITCHS

The safety switch shall be a heavy-duty low-voltage safety switch with the following requirements:

1. Rated for 600 V(ac) with number of poles as shown on the plans.
2. Terminals be copper-aluminum.
3. The enclosure shall be NEMA Type 4X dust-tight and oil-tight enclosure.
4. A metal nameplate shall be mounted on the front cover that contains switch information (type, catalog number, electrical ratings V, A, and horsepower).
5. Handle whose position is easily recognizable and padlockable in the "Off" position.
6. Visible blades.
7. Reinforced fuse clips.
8. Non-teasible, positive, quick-make quick-break mechanisms.
9. Switch assembly plus operating handle as an integral part of the enclosure.
10. Switch shall be UL listed, horsepower rated, meet Federal Specification WS-885c, and NEMA Specifications KSI, latest revision.
11. Switch shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "ON" position.
12. Switch shall have line terminal shields.

Submittals

Submittal package shall consist of six copies. Submittals shall be delivered to the Engineer at least 180 days prior to the start of the installation. The Engineer shall be allowed 90 days for review of the submittals. The following information shall be submitted to the Engineer for review and approval:

1. Dimension drawing and weight.
2. Technical certification sheet.
3. Conduit entry and exit locations.

10-3.30 SUPERVISORY CONTROL AND DATA ACQUISITION REMOTE TERMINAL UNIT SYSTEM

GENERAL

This work shall consists of the installation of one communication terminal box, one telephone terminal box, and wiring as shown on the plans and in conformance with these special provisions.

The Contractor's attention is directed to Section 86–1.04, "Equipment List and Drawings," of the Standard Specifications for the timely identification of the terminal box units, wiring, and products to be used by the Contractor.

The Contractor shall arrange for the procurement and installation of the communication and telephone terminal box units with the Engineer prior to procurement.

The communication and telephone terminal box units furnished by the Contractor, shall be part of the overall new San Francisco – Oakland Bay Bridge SCADA system, to be installed by others. To assure compatibility the Contractor shall procure and install identical terminal box units, including all wiring, to the San Francisco – Oakland Bay Bridge East Span Seismic Safety Skyway Project (Contract 04-012024).

SUBMITTALS

Submittals shall be delivered to the Engineer at least 180 days prior to the start of the installation. The Engineer will be allowed 90 days for review of the submittals.

Submittals (For Information)

When requested by the Engineer product data sheets information shall be submitted.

Submittals (For Final Acceptance)

The following information shall be submitted for record purposes prior to acceptance of the project:

1. Final as-built plans.
2. Wiring diagrams.
3. Part lists, operating, maintenance, and service instructions packaged or accompanying the equipment installed.
4. Seismic certification and anchorage details.

Submittals shall be available in paper format and on CD-ROM.

COMMUNICATION AND TELEPHONE TERMINAL BOX

Manufacture

Terminal box units and components shall be manufactured and tested in accordance with recognized UL, CSA, IEC and CE mark industrial standards. The standards requirements are as follows:

Agency Approvals Overview		Comments
Quality Assurance in Design/ Development, Production, Installation and Servicing	ISO9001	Certification by Underwriters Laboratories and BSI Quality Assurance
Safety for Industrial Control Equipment	UL508 C-UL or CSA 22.2, 142-M1987	Certification by Underwriters Laboratories Certification by Underwriters Laboratories [C-UL] or Canadian Standards Association for selected modules
Safety for Hazardous Locations Class I, Div II, A, B, C, D	UL1604 with C-UL FM3611 CSA22.2, 213-M1987	Certification by Underwriters Laboratory for selected modules Certification by Factory Mutual for selected modules Certification by Canadian Standards Association for selected modules

Standards Overview Environmental		Conditions
Enclosure Protection	ANSI/IEC 60529	Steel cabinet per IP54: protection from dust & splashing water

Support

Terminal box units shall have a warranty period of at least one year from the date of purchase. The contractor shall maintain the warranties of the product to the completion of the project.

Durability

The terminal box units and components shall be designed specifically for industrial environments.

Environmental Conditions

Terminal box units and components shall meet the following environmental specifications:

Humidity: From 5 percent to 95 percent relative humidity, non-condensing.
Temperature: From -40 to +200 °C.

INSTALLATION REQUIREMENTS

One telephone terminal box and one communication terminal box shall be installed by the Contractor. The Contractor shall be responsible for making a complete, operational loop check of each wire and cable installed and connected to the input and output terminals of existing telephone and communication terminal boxes and RTU. Loop checks shall be performed by simulating a contact closure as necessary to prove the operation of each circuit. The complete functional check including the SCADA existing Master PLC and workstations shall be performed under different contracts.

10-3.31 STRONG MOTION DETECTION SYSTEM

The Contractor shall install the strong motion detection system in accordance with the details shown on the plans, and the provisions in "Concrete Structures," "Steel Structures," "Miscellaneous Metal," and "Clean and Paint Structural Steel," in these special provisions.

GENERAL

Attention is directed to "Cooperation," and "Order of Work," of these special provisions.

For this contract the California Geological Survey (CGS) will install, test, and adjust the sensors and recorders of the seismic monitoring system.

System layouts shown on the plans are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

ORDER OF WORK

At each seismic sensor enclosure and recorder location, the sequence of work shall be as follows:

1. Complete the conduit system and pull in all cabling into the sensor enclosures.
2. Install Seismic recorder cabinet and ensure that electrical power and ISDN telephone service is present, and also that equipment ground is complete.
3. Notify the Engineer 20 working days in advance when California Geological Survey (CGS) is to install and test their equipment as specified in these special provisions.

COORDINATION WITH CALIFORNIA GEOLOGICAL SURVEY

Access and Contractor Assistance

The Contractor shall provide CGS personnel means and equipment to safely access and perform work at all recorder, sensor and antenna locations after all Contractor-installed equipment, conduit and cabling is completed. The Contractor's assistance shall include transportation of equipment on the job site, traffic control, and movement of stored materials or parked vehicles where necessary.

California Geological Survey Requirements

At recorder location, CGS will require the following:

1. Convenient access to the recorder housing prior to it's installation for the purpose of preparing to mount the recorders into the housing.
2. Approximately three days access at recorder location to install and wire the recorders.
3. Access to recorder location during the installation and testing of the sensors wired to that recorder.
4. Approximately one day access at recorder location during the final system testing and any necessary troubleshooting and repairs.

At normal sensor locations, CGS will require approximately 30 minutes work time, excluding transit time, at each sensor location on a minimum of two occasions (installation and operational testing) to accomplish their work.

MATERIALS

Telephone ISDN Cable: Telephone cable shall be waterproof filled-sheath, ISDN rated cable with four twisted pairs, individually shielded stranded conductor, minimum AWG No. 22 tinned copper, polyethylene insulated, with a foil aluminum-polyester shield, and chrome PVC jacket rated for 300 V. Cable spools shall be of sufficient length to allow the cables to be installed without splices from telephone service point to the seismic recorders.

Recorder Cabinet: Caltrans Type S Corrosion Resistant (Stainless Steel or Aluminum) without shelves or police panel. Refer to Caltrans Standard Plan sheet ES-3A and Caltrans Standard Specials, Section 86-3.04A.

Sensor Cable: Sensor cable shall be eight (8) tinned copper, insulated conductors (4 twisted shielded pairs with individual drain wires), AWG No. 22 (7 x 30 stranded) with insulation 0.178 mm thick. Cable shall have an overall aluminum-polyester shield, AWG No. 22 stranded tinned copper drain wires, an outer jacket 0.229 mm thick and an overall nominal outside diameter of 7.62 mm or less. Cable shall be instrument cable, NEC rated CL2P plenum cable rated for 150 °C. Cable shall have a color code as specified below:

1. Color Code: 1st pair – red, black; 2nd pair – white, brown; 3rd pair – blue, violet; 4th pair – yellow, orange
2. Sensor cable shall be United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.
3. Spare cable shall be the same as sensor cable.

Interconnecting Cable: Interconnecting cable shall be eight tinned copper, insulated conductors (4 twisted pairs), AWG No. 22 (7 x 32 stranded) with insulation 0.178 mm thick and an overall aluminum-polyester shield. Cable shall have an overall tinned copper braid shield (90 percent coverage), an AWG No. 24 stranded tinned copper drain wire, an outer jacket 0.229 mm thick and an overall nominal outside diameter of 8.89 mm or less. Cable shall be ANSI/EIA RS-485 Applications cable, NEC rated CL2P plenum cable rated for 150 °C. Cable shall have a color code as specified below:

1. 1st pair – White/Blue Stripe, Blue/White Stripe;
2. 2nd pair – White/Orange Stripe, Orange/White Stripe;
3. 3rd pair – White/Green Stripe, Green/White Stripe;
4. 4th pair – White/Brown Stripe, Brown/White Stripe.

Interconnecting cable shall be United Wire and Cable Co., Inc.; Consolidated Wire and Cable; or equal.

TELEPHONE SERVICE

The permits, licenses and all charges required for the connection of the Integrated System Digital Network (ISDN) telephone service are included on the Skyway contract.

TESTING

After all the seismic sensors and recorders have been installed and connected by the CGS, the seismic monitoring system shall be tested by the CGS to insure that the system functions properly. The Contractor shall make necessary repairs and replacements at the Contractor's expense if the resource of the problem is determined to be part of the Contractor's scope of work.

After the seismic monitoring system installation work has been completed, the seismic monitoring system shall be tested in the presence of the Engineer to demonstrate that the seismic monitoring system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and re-tests at the Contractor's expense.

SUBMITTALS

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval. The Engineer will require 3 weeks to review the submittal after a complete set has been received, as determined by the Engineer.

Manufacturer's descriptive data shall be submitted for the following:

1. Conduit – list by size and installation method
2. Pull boxes – each type
3. Seismic sensor cable
4. Interconnect cable
5. ISDN telephone cable
6. Seismic sensor enclosures – each type
7. Seismic sensor cable junction boxes – each type
8. Seismic recorder cabinet

Attention is directed to the provisions in Section 5-1.01, "Authority of the 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 the specified submittals, as necessary to determine the quality or acceptability of such materials or products.

The submittals shall be delivered to the Office of Structure Design, Documents Unit, Fourth Floor, 1801 – 30th Street, Sacramento, California 95816.

Each submission of drawings, materials lists, and descriptive data shall consist of at least five copies. Two copies will be returned to the Contractor either approved for use or returned for correction and re-submittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall not be larger than 559 mm x 915 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.

Unapproved samples and samples not incorporated in the work shall be removed from State Right of Way, when directed by the Engineer.

10-3.32 CLOSEOUT SUBMITTALS

One set of the half-size project plans, on 279 mm x 432 mm in size, shall be kept on file by the Contractor for the sole purpose of recording electrical as-built information. As-built information recorded by the Contractor on the project plans shall include the following:

1. All clarification and change orders.
2. Location of underground utilities.
3. All changes in size, manufacture, or location of features.

All corrections shall be made in red ink or red pencil. Superseded material shall be neatly lined out. Original figures shall not be eradicated nor written over. Each sheet shall be clearly marked as having "As-Built Changes" or "No As-Built Changes" as appropriate.

Supplemental plan sheets shall be included when as-built information cannot be clearly shown on project plans. Supplemental plan sheets for the as-built shall have the contract number and must be 279 mm x 432 mm in size and on 75 g/m^2 (minimum) bond paper.

The final location of all underground utilities shall be recorded by depth from finished grade and by offset distance from permanent surface structures. Equipment within the building and all concealed conduits shall be recorded by offset distances from building walls.

Before the final inspection, the Contractor must submit the as-built to the Engineer for review to determine completeness and adequacy. If the as-built is unacceptable, the Contractor shall record the required information as directed by the Engineer. If the as-built is acceptable the Contractor shall sign and date the as-built certifying that all the information shown is correct.

The as-built shall be submitted to the Engineer prior to acceptance of the contract.

10-3.33 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Caltrans Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, (415) 330-6509 and stockpiled.

Motors, and light fixtures from the 4 existing high mast lights that are to be removed and disposed of, shall be salvaged and hauled to the address above. The rest of the high mast lights shall become the property of the Contractor.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.34 PAYMENT

The contract lump sum price paid for the following items shall include full compensation for furnishing all labor, materials, tools equipment, and incidentals, and for doing all the work involved in the listed items below, complete in place, including manuals, preparation and delivery of any and all proposals, plans, submittals, or documents to the Engineer, warranty work or modifications, software or software changes, testing and training, as shown on the plans, as specified in the Standard Provisions and these special provisions, and as directed by the Engineer:

1. Roadway and Girder Level Eastbound.
2. Underground and Roadway at Grade.
3. Removal Electrical.
4. SCADA Remote Terminal Unit System.
5. Call Box System.
6. Strong Motion Detection System.

The contract lump sum price paid for traffic operations system shall include full compensation for furnishing all labor, materials (except items covered by other bid items), tools, equipment, and incidentals, and for doing all the work involved in installing traffic operations system, complete in place, including all the foundations (except for the changeable message sign), poles, manuals and testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for the installation of high mast lighting shall be considered as included in the contract lump sum price paid for underground and roadway at grade and no separate payment will be made therefor.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for roadway and girder level eastbound.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

If any of the fabrication sites for the materials listed are located more than 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 $2000:

1. Closed circuit television cabinets furnished by the Contractor

AMENDMENTS TO THE STANDARD SPECIFICATIONS

DATED JULY 1999

AMENDMENTS ISSUE DATE: 11-15-10

SECTION 0 GLOBAL REVISIONS
(Issued 07-01-08)

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
3. Replace "Engineer's Estimate" with "verified Bid Item List"
4. Replace "Notice to Contractors" with "Notice to Bidders"
5. Except in "Contract Project Information Signs," replace "Project Information" with "Supplemental Project Information"

Where Standard Specifications refer to the special provisions to describe the work, interpret the reference to the Bid Item List, the special provisions, or both.

Interpret a reference to the Standard Specifications as a reference to the Standard Specifications as amended in these Amendments to the Standard Specifications.

^^

SECTION 1 DEFINITIONS AND TERMS
(Issued 11-15-10)

Replace Section 1 with:

SECTION 1 GENERAL

1-1 GENERAL

1-1.01 GENERAL

Section 1 includes general rules of interpretation.

The Department is gradually standardizing the style and language of the specifications. The new style and language includes:

1. Use of:

    1.1. Imperative mood
    1.2. Introductory modifiers
    1.3. Conditional clauses

2. Elimination of:

    2.1. Language variations
    2.2. Definitions for industry-standard terms
    2.3. Redundant specifications
    2.4. Needless cross-references

The use of this new style does not change the meaning of a specification not yet using this style.

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.

Headings are included for the purposes of organization and referencing. Inclusion of a heading with no related content, "Reserved," or "Not Used" does not indicate that no specification exists for that subject; applicable specifications may be covered in a general or referenced specification.

1-2 REFERENCES

1-2.01 REFERENCES

A reference within parentheses to a law or regulation is included in the contract for convenience only and is not a comprehensive listing of related laws and regulations. Lack of a reference does not indicate no related laws or regulations exist.

If the version of a referenced document is not specified, use the current version in effect on the date of Notice to Bidders.

A reference to a subsection includes the section's general specifications of which the subsection is a part.

A code not specified as a Federal code is a California code.

1-3 ABBREVIATIONS AND MEASUREMENT UNITS

1-3.01 ABBREVIATIONS

Abbreviations

Abbreviation	Meaning
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CIH	Certified Industrial Hygienist
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIA	Electronic Industries Alliance
ETL	Electrical Testing Laboratories
FHWA	Federal Highway Administration
IEEE	Institute of Electrical and Electronics Engineers
NETA	National Electrical Testing Association, Inc.
NEMA	National Electrical Manufacturers Association
PLAC	permit, license, agreement, certification, or any combination of these
SSPC	The Society for Protective Coatings
UL	Underwriters' Laboratories Inc.

1-3.02 MEASUREMENT UNITS

Some of the symbols for units of measurement used in the specifications and in the Bid Item List are defined as follows. The symbols for other units of measurement used in the specifications are as defined in ASTM E 380 or in the various specifications and test referenced in the specifications.

Measurement Units

Symbols as used in the specifications	Symbols as used in the Bid Item List	Meaning
A	—	amperes
—	EA	each
g	G	gram
kg	KG	kilogram
ha	HA	hectare (10 000 m^2)
h	H	hour
J	—	joule
—	LNKM	lane kilometer
L	L	liter
—	LS	lump sum
m	M	meter
km	KM	kilometer
mm	MM	millimeter
µm	—	micrometer
nm	—	nanometer
m^2	M2	square meter
m^3	M3	cubic meter
N	—	newton
N·m	—	newton meter
Ω	—	ohm
Pa	—	pascal
kPa	—	kilopascal
MPa	—	megapascal
s	—	second
—	STA	station (100 m)
—	TAB	tablet
tonne	TONN	metric ton (1000 kg)
W	—	watt

1-4 DEFINITIONS

1-4.01 GENERAL

Interpret terms as defined in the contract documents. A construction-industry term not defined in the contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

1-4.02 GLOSSARY

acceptance: Formal written acceptance by the Director of an entire contract that has been completed in all respects in accordance with the plans and specifications and any modifications to them previously approved.

base: Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

basement material: Material in excavation or embankments underlying the lowest layer of subbase, base, pavement, surfacing, or other specified layer to be placed.

bid item: Specific work unit for which the bidder provides a price.

Bid Item List: List of bid items and the associated quantities.

Bid Item List, verified: Bid Item List with verified prices. The Contract Proposal of Low Bidder at the Department's Web site is the verified Bid Item List.

bridge: Structure, with a bridge number, that carries a utility facility, or railroad, highway, pedestrian or other traffic, over a water course or over or under or around any obstruction.

building-construction contract: Contract that has "building construction" on the cover of the Notice to Bidders and Special Provisions.

business day: Day on the calendar except Saturday or holiday.

California Manual on Uniform Traffic Control Devices: The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California.

Certified Industrial Hygienist: Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

conduit: Pipe or tube in which smaller pipes, tubes, or electrical conductors are inserted or are to be inserted.

contract: Written and executed contract between the Department and the Contractor.

contract bonds: Security for the payment of workers and suppliers furnishing materials, labor, and services and for guaranteeing the Contractor's work performance.

contract item: Bid item.

Contractor: Person or business or its legal representative entering into a contract with the Department for performance of the work.

culvert: Structure, other than a bridge, that provides an opening under a roadway for drainage or other purposes.

day: 24 consecutive hours running from midnight to midnight; calendar day.

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

Department: Department of Transportation as defined in St & Hwy Code § 20 and authorized in St & Hwy Code § 90; its authorized representatives.

detour: Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

Director: Department's Director.

Disabled Veteran Business Enterprise: Business certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.

divided highway: Highway with separated traveled ways for traffic, generally in opposite directions.

Engineer: Department's Chief Engineer acting either directly or through properly authorized agents; the agents acting within the scope of the particular duties delegated to them.

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

fixed costs: Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

frontage road: Local street or road auxiliary to and located generally on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

grading plane: Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

highway: Whole right of way or area that is reserved for and secured for use in constructing the roadway and its appurtenances.

holiday:

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. Day after Thanksgiving Day
14. December 25th, Christmas Day

If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday. Interpret "legal holiday" as "holiday."

informal-bid contract: Contract that has "Informal Bid Authorized by Pub Cont Code §10122" on the cover of the Notice to Bidders and Special Provisions.

Information Handout: Supplemental project information furnished to bidders as a handout.

laboratory: Laboratory authorized by the Department to test materials.

liquidated damages: Amount prescribed in the specifications, pursuant to the authority of Pub Cont Code § 10226, to be paid to the State or to be deducted for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

median: Portion of a divided highway separating the traveled ways for traffic in opposite directions including inside shoulders.

Notice to Bidders: Document that provides a general work description, bidder and bid specifications, and the time and location the Department receives bids.

pavement: Uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with surfacing.

plans: Official project plans and Standard Plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. These documents are to be considered as a part of the plans.

In the above definition, the following terms are defined as follows:

Standard Plans: Standard Plans issued by the Department.

project plans: Specific details and dimensions peculiar to the work supplemented by the Standard Plans insofar as the same may apply.

roadbed: Area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed. Where the medians are so wide as to include areas of undisturbed land, a divided highway is considered as including 2 separate roadbeds.

roadway: Highway portion included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, and including all the appertaining structures, and other features necessary to proper drainage and protection.

shoulder: Roadway portion contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

special provisions: Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to these Standard Specifications. The Department's publication titled "Labor Surcharge And Equipment Rental Rates" is part of the special provisions.

specifications: Directions, provisions, and requirements contained in these Standard Specifications, Amendments to the Standard Specifications, and the special provisions. Where the term "these specifications" or "these Standard Specifications" is used in this book, it means the provisions set forth in this book.

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

Structure Design: Offices of Structure Design of the Department.

subbase: Layer of specified material of planned thickness between a base and the basement material.

subgrade: Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

substructure: Bridge portions below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wingwalls of bridges are portions of the substructure.

superstructure: Bridge portion except the bridge substructure.

supplemental project information: Information relevant to the project, specified as supplemental project information, and made available to bidders.

surfacing: Uppermost layer of material placed on the traveled way, or shoulders. This term is used interchangeably with pavement.

traffic lane: Portion of a traveled way for the movement of a single line of vehicles.

traveled way: Portion of the roadway for the movement of vehicles, exclusive of shoulders.

total bid: Sum of the item totals as verified by the Department; original contract price.

withhold: Money temporarily or permanently taken from progress payment. Withholds are not retentions under Pub Cont Code § 7107.

work: All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments, or extensions to it made by contract change order or other written orders of the Engineer.

1-5 DISTRICTS

District Composition and Office Addresses

District	Counties	Location Address	Mailing Address
1	Del Norte (DN), Humboldt (Hum), Lake (Lak), Mendocino (Men)	1656 UNION ST EUREKA, CA	PO BOX 3700 EUREKA CA 95502
2	Lassen (Las), Modoc (Mod), Plumas (Plu), Shasta (Sha), Siskiyou (Sis), Tehama (Teh), Trinity (Tri)	1657 RIVERSIDE DR REDDING, CA	PO BOX 496073 REDDING CA 96049-6073
3	Butte (But), Colusa (Col), El Dorado (ED), Glenn (Gle), Nevada (Nev), Placer (Pla), Sacramento (Sac), Sierra (Sie), Sutter (Sut), Yolo (Yol), Yuba (Yub)	703 B ST MARYSVILLE, CA	PO BOX 911 MARYSVILLE CA 95901
4	Alameda (Ala), Contra Costa (CC), Marin (Mrn), Napa (Nap), San Francisco (SF), San Mateo (SM), Santa Clara (SCl), Solano (Sol), Sonoma (Son)	111 GRAND AVE OAKLAND, CA	PO BOX 23660 OAKLAND CA 94623-0660
5	Monterey (Mon), San Benito (SBt), San Luis Obispo (SLO), Santa Barbara (SB), Santa Cruz (SCr)	50 HIGUERA ST SAN LUIS OBISPO, CA	50 HIGUERA ST SAN LUIS OBISPO CA 93401-5415
6	Fresno (Fre), Kern (Ker), Kings (Kin), Madera (Mad), Tulare (Tul)	1352 W. OLIVE AVE FRESNO, CA	PO BOX 12616 FRESNO CA 93728-2616
7	Los Angeles (LA), Ventura (Ven)	100 S. MAIN ST LOS ANGELES	100 S MAIN ST LOS ANGELES CA 90012
8	Riverside (Riv), San Bernardino (SBd)	464 W 4TH ST SAN BERNARDINO, CA	464 W 4TH ST SAN BERNARDINO CA 92401-1400
9	Inyo (Iny), Mono (Mno)	500 S MAIN ST BISHOP, CA	500 S MAIN ST BISHOP CA 93514-3423
10	Alpine (Alp), Amador (Ama), Calaveras (Cal), Mariposa (Mpa), Merced (Mer), San Joaquin (SJ), Stanislaus (Sta), Tuolumne (Tuo)	1976 E CHARTER WAY STOCKTON, CA	PO BOX 2048 STOCKTON CA 95201
11	Imperial (Imp), San Diego (SD)	4050 TAYLOR ST SAN DIEGO, CA	4050 TAYLOR ST SAN DIEGO CA 92110-2737
12	Orange (Ora)	3347 MICHELSON DR STE 100 IRVINE, CA	3347 MICHELSON DR STE 100 IRVINE CA 92612-0661

A project with work in District 1, 2, or 3 is a North Region project. For Districts 1, 2, and 3, interpret each reference to the district office as the North Region office. The North Region office address is the District 3 address.

1-6 WEB SITES, ADDRESSES, AND TELEPHONE NUMBERS

Web Sites, Addresses, and Telephone Numbers

Agency, Department Unit, or Reference	Web Site	Address	Telephone No.
Bidders' Exchange	www.dot.ca.gov/hq/esc/oe/bidex	MSC 26 BIDDERS' EXCHANGE DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	(916) 227-6259
Department	www.dot.ca.gov		
Department of General Services, Office of Small Business and DVBE Services	www.pd.dgs.ca.gov/smbus/default.htm	OFFICE OF SMALL BUSINESS AND DVBE SERVICES DEPARTMENT OF GENERAL SERVICES 707 3RD ST WEST SACRAMENTO CA 95605-2811	(800) 559-5529 (916) 375-4940
Department of Industrial Relations	www.dir.ca.gov		
Department of Industrial Relations, Division of Apprenticeship Standards		455 GOLDEN GATE AVENUE SAN FRANCISCO, CA 94102	
Division of Accounting, Office of External Accounts Payable	http://www.dot.ca.gov/hq/asc/oap/payments/contact.htm#conpets1	MAJOR CONSTRUCTION PAYMENT AND INFORMATION UNIT OFFICE OF EXTERNAL ACCOUNTS PAYABLE DIVISION OF ACCOUNTING DEPARTMENT OF TRANSPORTATION P.O. BOX 168043 SACRAMENTO, CA 95816-8043	(916) 227-9013
Office Engineer		MSC 43 OFFICE ENGINEER DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	
Office Engineer–Verified Bid Results	http://www.dot.ca.gov/hq/esc/oe/awards/bidsum_html/6week_list.html.		
Offices of Structure Design, Documents Unit		MSC 9-4/4I DOCUMENTS UNIT OFFICES OF STRUCTURE DESIGN DEPARTMENT OF TRANSPORTATION 1801 30TH ST SACRAMENTO CA 95816-7006	(916) 227-0716

Publication Distribution Unit		PUBLICATION UNIT DEPARTMENT OF TRANSPORTATION 1900 ROYAL OAKS DRIVE SACRAMENTO CA 95815-3800	
Transportation Laboratory		MATERIALS AND ENGINEERING TESTING SERVICES AND GEOTECHNICAL SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612	(916) 227-7000
Department's Pre-Qualified Products List	http://www.dot.ca.gov/hq/esc/approved_products_list		

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SECTION 2 PROPOSAL REQUIREMENTS AND CONDITIONS
(Issued 11-15-10)

Replace Section 2 with:

SECTION 2 BIDDING

2-1.01 GENERAL

Section 2, "Bidding," includes specifications related to bid eligibility and the bidding process.

2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submit a bid
2. Subcontract for a part of the work
3. Supply materials

2-1.03 BID DOCUMENTS

2-1.03A General

Standard Specifications and Standard Plans may be viewed at the Department's Web site and may be purchased at the Publication Distribution Unit.

Special provisions, Amendments to the Standard Specifications, and project plans may be viewed at the Bidders' Exchange. To obtain bid books, submit a request to the Bidders' Exchange. For an informal-bid contract, you may also obtain special provisions, Amendments to the Standard Specifications, and project plans at the Bidders' Exchange.

2-1.03B Supplemental Project Information

Logs of test borings attached to the project plans are supplemental project information. The Department makes other supplemental information available as specified in the special provisions.

If an Information Handout is available, you may view it at:

http://www.dot.ca.gov/hq/esc/oe/weekly_ads/index.php

If rock cores are available for inspection, you may view them by sending a request to Coreroom@dot.ca.gov. If other supplemental project information is available for inspection, you may view it by phoning in a request. Make your request at least 7 days before viewing. Include in your request:

1. District-County-Route
2. Contract number
3. Viewing date
4. Contact information, including telephone number.

For rock cores, also include the bridge number in your request.
If bridge as-built drawings are available:

1. For a project in District 1 through 6 or 10, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357
2. For a project in District 7, 8, 9, 11, or 12, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, telephone (213) 897-0877

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

2-1.04–2-1.10 RESERVED

2-1.11 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

2-1.12 BID DOCUMENT COMPLETION

2-1.12A General

Complete forms in the Bid book.

On the Subcontractor List you may either submit each subcontracted bid item number and corresponding percentage with your bid or fax this information to (916) 227-6282 within 24 hours after bid opening. If you fail to submit this information within the time specified, your bid is nonresponsive.

Except for the bid item number and the percentage of each item subcontracted, do not fax submittals.

2-1.12B Bid Item List and Bid Comparison

Submit a bid based on the work item quantities the Department shows in the Bid Item List.

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time. If your bid for time exceeds the number of working days described in the Notice to Bidders, your bid is nonresponsive.

2-1.12C Subcontractor List

In the Subcontractor List, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.)

The Subcontractor List must show the name, address, and work portions to be performed by each subcontractor listed. Show work portion by bid item number, description, and percentage of each bid item subcontracted.

2-1.13 BIDDER'S SECURITY

Submit your bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Bidder's bond signed by a surety insurer who is licensed in California

Make checks and bonds payable to the Department of Transportation.

If paying with a bidder's bond, you may use the form in the Bid book. If you do not use the form in the Bid book, use a form containing the same information.

2-1.14 BID SUBMITTAL

Submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.15 BID WITHDRAWAL

You or an authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.

After the bid opening time, you cannot withdraw a bid.

2-1.16 BID OPENING

The Department publicly opens and reads bids at the time and place described in the Notice to Bidders. The Department invites bidders or their authorized agents to attend.

2-1.17 BID REJECTION

The Department may reject:

1. All bids
2. A nonresponsive bid

2-1.18 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to the Office Engineer. For Relief of Bid Request form, go to:

http://www.dot.ca.gov/hq/esc/oe/contractor_info/relief.pdf

2-1.19 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

2-1.20 BID RIGGING

Section 2-1.20, "Bid Rigging," applies to a Federal-aid contract.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available Monday through Friday between 11:00 a.m. and 8:00 p.m. and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

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SECTION 3 AWARD AND EXECUTION OF CONTRACT
(Issued 11-15-10)

Replace Section 3 with:

SECTION 3 CONTRACT AWARD AND EXECUTION

3-1.01 SCOPE

Section 3, "Contract Award and Execution," includes specifications related to contract award and execution.

3-1.02 CONTRACT AWARD

Submit any bid protest to the Office Engineer.

If the Department awards the contract, the award is made to the lowest responsible bidder within the number of days shown in the following table:

Contract Award Period

Days (after bid opening)	Project Estimated Cost shown in the Notice to Bidders
30	< $200 million
60	≥ $200 million

The Department may extend the specified award period if the bidder agrees.

3-1.03 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222)

The successful bidder must furnish:

1. Payment bond to secure the claim payments of laborers, workers, mechanics, or materialmen providing goods, labor, or services under the contract. This bond must be equal to at least 100 percent of the total bid.
2. Performance bond to guarantee the faithful performance of the contract. This bond must be equal to at least 50 percent of the total bid.

The Department furnishes the successful bidder with the bond forms.

3-1.04 CONTRACTOR LICENSE

For a Federal-aid contract, the Bidder must be properly licensed (Pub Cont Code § 10164) from contract award through contract acceptance.

For a non-Federal-aid contract:

1. The Bidder must be properly licensed from bid opening through contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

3-1.05 INSURANCE POLICIES

The successful bidder must submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.
2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.
3. A declaration under the penalty of perjury by a CPA certifying the accountant has applied GAAP guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is over $50,000.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure under Labor Code § 3700.

3-1.06–3-1.08 RESERVED

3-1.09 CONTRACT EXECUTION

The successful bidder must sign the contract and return it to the Office Engineer along with:

1. Contract bonds
2. Documents identified in Section 3-1.05, "Insurance Policies"

For an informal-bid contract, the Office Engineer must receive these documents before the 5th business day after the bidder receives the contract. For all other contracts, the Office Engineer must receive these documents before the 10th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract within the time specified (Pub Cont Code §§ 10181, 10182, and 10183).

The following is a copy of the Contract form:

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION
CONTRACT
DES-OE-0103A (REV 03/2010)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONTRACT NO. _____

This contract is entered into between the State of California's Department of Transportation and the Contractor named below:

_____
CONTRACTOR'S NAME

The parties agree to comply with the terms of the following exhibits that are by this reference made a part of this contract.

Exhibit A - Bid book dated _____
Exhibit B - Notice to Bidders and Special Provisions dated _____
Exhibit C - Project Plans approved _____
Exhibit D - Standard Specifications dated _____
Exhibit E - Standard Plans dated _____
Exhibit F - Addenda

Exhibits A, B, C, and F are those exhibits identified with the same contract number as this contract.

This contract has been executed by the following parties:

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*	
BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	
FEDERAL EMPLOYER IDENTIFICATION NUMBER	LICENSE NUMBER

DEPARTMENT OF TRANSPORTATION

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	

This contract has been certified as complying with the State Contract Act:

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

3-1.10 BIDDERS' SECURITIES

The Department keeps the securities of the 1st, 2nd, and 3rd low bidders until the contract has been executed. The other bidders' securities, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd low bidders, and their bidders' bonds are of no further effect (Pub Cont Code § 10184).

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SECTION 4 SCOPE OF WORK
(Issued 07-01-08)

Add to Section 4-1.01:

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

Add:

4-1.015 PROJECT DESCRIPTION

Construct the work described in the special provisions and on project plans and by the bid items. The special provisions, project plans, and bid item descriptions set forth the specifications that apply.

Add:

4-1.035 VALUE ENGINEERING

4-1.035A General

Reserved

4-1.035B Value Engineering Change Proposal

You may submit a VECP to reduce any of the following:

1. Total cost of construction
2. Construction activity duration
3. Traffic congestion

Before preparing a VECP, meet with the Engineer to discuss:

1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, such as:

1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:

1. Description of the contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of contract specifications and drawing details that would be changed.
3. Detailed cost estimate for performing the work under the existing contract and under the proposed change. Determine the estimates under Section 9-1.03, "Force Account Payment."
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

The Department is not required to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to drawings or specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

Until the Department approves a change order incorporating the VECP or parts of it, continue to perform the work under the contract. If the Department does not approve a change order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a change order that:

1. Incorporates changes in the contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay you 50 percent of the estimated net savings

In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation cost, including parts paid by you.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only to the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

4-1.035C Value Analysis Workshop

Section 4-1.035C, "Value Analysis Workshop," applies to a non-building-work contract with a total bid of over $5 million.

You may request a value analysis workshop by submitting a request after contract approval.

The Department offers a value analysis workshop to:

1. Identify value enhancing opportunities
2. Consider changes to the contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in Section 4-1.035B, "Value Engineering Change Proposal."

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

The workshop must be conducted under the methods described in the Department's Value Analysis Team Guide available at:

http://www.dot.ca.gov/hq/oppd/value/

The facilitator must be a certified value specialist as recognized by the Society of American Value Engineers.

The Department reimburses you for 1/2 of the workshop cost. The workshop cost is the sum of the workshop-facilitator cost and the workshop-site cost. The Department determines the workshop cost based on the facilitator

and workshop-site invoice prices minus any available or offered discounts. The Department does not pay you for any other associated costs.

^^

SECTION 5 CONTROL OF WORK
(Issued 11-15-10)

Add:

5-1.005 GENERAL

Failure to comply with any specification part is a waiver of your right to an adjustment of time and payment related to that part.

After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, 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.

Add to 5-1.01:

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

Add:

5-1.012 PARTNERING

5-1.012A General

The Department strives to work cooperatively with all contractors; partnering is our way of doing business. The Department encourages project partnering among the project team, made up of significant contributors from the Department and the Contractor, and their invited stakeholders.

For a project with a total bid greater than $1 million, professionally facilitated project partnering is encouraged.

For a project with a total bid greater than $10 million, professionally facilitated project partnering is required.

In implementing project partnering, you and the Engineer manage the contract by:

1. Using early and regular communication with involved parties
2. Establishing and maintaining a relationship of shared trust, equity, and commitment
3. Identifying, quantifying, and supporting attainment of mutual goals
4. Developing strategies for using risk management concepts
5. Implementing timely communication and decision making

6. Resolving potential problems at the lowest possible level to avoid negative impacts
7. Holding periodic partnering meetings and workshops as appropriate to maintain partnering relationships and benefits throughout the life of the project
8. Establishing periodic joint evaluations of the partnering process and attainment of mutual goals

Partnering does not void any contract part.

The Department's "Field Guide to Partnering on Caltrans Construction Projects" current at the time of bid is available to the project team as reference. This guide provides structure, context, and clarity to the partnering process requirements. This guide is available at the Department's Partnering Program website:

http://www.dot.ca.gov/hq/construc/partnering.html

In implementing project partnering, the project team must:

1. Create a partnering charter that includes:

    1.1. Mutual goals, including core project goals and may also include project-specific goals and mutually supported individual goals.
    1.2. Partnering maintenance and close-out plan.
    1.3. Dispute resolution plan that includes a dispute resolution ladder and may also include use of facilitated dispute resolution sessions.
    1.4. Team commitment statement and signatures.

2. Participate in monthly partnering evaluation surveys to measure progress on mutual goals and may also measure short-term key issues as they arise.
3. Evaluate the partnering facilitator on Forms CEM-5501 and CEM-5502. The Engineer provides the evaluation forms to the project team and collects the results. The Department makes evaluation results available upon request. Facilitator evaluations must be completed:

    3.1. At the end of the initial partnering workshop on Form CEM-5501.
    3.2. At the end of the project close-out partnering workshop on Form CEM-5502.

4. Conduct a project close-out partnering workshop.
5. Document lessons learned before contract acceptance.

5-1.012B Partnering Facilitator, Workshops, and Monthly Evaluation Surveys

The Engineer sends you a written invitation to enter into a partnering relationship after contract approval. Respond within 15 days to accept the invitation and request the initial and additional partnering workshops. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering evaluation survey with a 5-point rating and agrees to follow the Department's "Partnering Facilitator Standards and Expectations" available at the Department's Partnering Program website
2. Schedule initial partnering workshop
3. Determine initial workshop site and duration
4. Agree to other workshop administrative details

Additional partnering workshops and sessions are encouraged throughout the life of the project as determined necessary by you and the Engineer, recommended quarterly.

5-1.012C Training in Partnering Skills Development

For a project with a total bid of $25 million or greater, training in partnering skills development is required.

For a project with a total bid between $10 million and $25 million, training in partnering skills is optional.

You and the Engineer cooperatively schedule the training session and select a professional trainer, training site, and 1 to 4 topics from the following list to be covered in the training:

1. Active Listening

2. Building Teams
3. Change Management
4. Communication
5. Conflict Resolution
6. Cultural Diversity
7. Dealing with Difficult People
8. Decision Making
9. Effective Escalation Ladders
10. Emotional Intelligence
11. Empathy
12. Ethics
13. Facilitation Skills
14. Leadership
15. Partnering Process and Concepts
16. Project Management
17. Project Organization
18. Problem Solving
19. Running Effective Meetings
20. Time Management
21. Win-Win Negotiation

Before the initial partnering workshop, the trainer conducts a 1-day training session in partnering skills development for the Contractor's and the Engineer's representatives. This training session must be a separate session from the initial partnering workshop and must be conducted locally. The training session must be consistent with the partnering principles under the Department's "Field Guide to Partnering on Caltrans Construction Projects."

Send at least 2 representatives to the training session. One of these must be your assigned representative as specified in Section 5-1.06, "Superintendence," of the Standard Specifications.

5-1.012D Payment

The Department pays you for:

1. 1/2 of partnering workshops and sessions based on facilitator and workshop site cost
2. 1/2 of monthly partnering evaluation survey service cost
3. Partnering skills development trainer and training site cost

The Department determines the costs based on invoice prices minus any available or offered discounts. The Department does not pay markups on these costs.

The Department does not pay for wages, travel expenses, or other costs associated with the partnering workshops and sessions, monthly partnering evaluation surveys, and training in partnering skills development.

Add:

5-1.015 RECORDS

5-1.015A General

Reserved

5-1.015B Record Retention

Retain project records from bid preparation through:

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

For at least 3 years after the later of these, retain cost records, including records of:

1. Bid preparation
2. Overhead
3. Payrolls
4. Payments to suppliers and subcontractors

5. Cost accounting

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

5-1.015C Record Inspection, Copying, and Auditing

Make your records available for inspection, copying, and auditing by State representatives for the same time frame specified under Section 5-1.015B, "Record Retention." The records of subcontractors and suppliers must be made available for inspection, copying, and auditing by State representatives for the same period. Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 business days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

5-1.015D Cost Accounting Records

Maintain cost accounting records for the project distinguishing between the following work cost categories:

1. Contract item work
2. Work character changes
3. Force account work
4. Extra work
5. Work performed under protests and claim notifications
6. Overhead
7. Subcontractors, suppliers, owner-operators, and professional services

Cost accounting records must include:

1. Final cost code lists and definitions
2. Itemization of the materials used and corresponding vendor's invoice copies
3. Direct cost of labor
4. Equipment rental charges
5. Workers' certified payrolls
6. Equipment:

    6.1. Size
    6.2. Type
    6.3. Identification number
    6.4. Hours operated

5-1.015E Extra Work Bills

Maintain separate records for force account costs.

Within 7 days after performing the work, submit extra work bills using the Department's Internet extra work billing system.

The Contractor submitting and the Engineer approving an extra work bill using the Internet force account work billing system is the same as each party signing the report.

The Department provides billing system:

1. Training within 30 days of your written request
2. Accounts and user identification to your assigned representatives after a representative has received training

Each representative must maintain a unique password.

Replace Section 5-1.02A with:

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."

Replace Section 5-1.04 with:

5-1.04 CONTRACT COMPONENTS

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:

    1.1. Special provisions
    1.2. Project plans
    1.3. Revised Standard Plans
    1.4. Standard Plans
    1.5. Amendments to the Standard Specifications
    1.6. Standard Specifications
    1.7. Supplemental project information

2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

Add:

5-1.055 SUBCONTRACTING

5-1.055A General

No subcontract releases you from the contract or relieves you of your responsibility for a subcontractor's work.

If you violate Pub Cont Code § 4100 et seq., the Department may exercise the remedies provided under Pub Cont Code § 4110. The Department may refer the violation to the Contractors State License Board as provided under Pub Cont Code § 4111.

Perform work equaling at least 30 percent of the value of the original total bid with your employees and with equipment owned or rented by you, with or without operators.

Each subcontract must comply with the contract.

Each subcontractor must have an active and valid State contractor's license with a classification appropriate for the work to be performed (Bus & Prof Code, § 7000 et seq.).

Submit copies of subcontracts upon request.

Before subcontracted work starts, submit a Subcontracting Request form.

Do not use a debarred contractor; a current list of debarred contractors is available at the Department of Industrial Relations' Web site.

Upon request, immediately remove and not again use a subcontractor who fails to prosecute the work satisfactorily.

Replace Section 5-1.07 with:

5-1.07 LINES AND GRADES

The Engineer places stakes and marks under Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

Submit your request for Department-furnished stakes:

1. On a Request for Construction Stakes form. Ensure:

    1.1. Requested staking area is ready for stakes
    1.2. You use the stakes in a reasonable time

2. A reasonable time before starting an activity using the stakes

Establish priorities for stakes and note priorities on the request.

Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

Replace Section 5-1.116 with:

5-1.116 DIFFERING SITE CONDITIONS (23 CFR 635.109)

5-1.116A Contractor's Notification

Promptly notify the Engineer if you find either of the following:

1. Physical conditions differing materially from either of the following:

    1.1. Contract documents
    1.2. Job site examination

2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract

Include details explaining the information you relied on and the material differences you discovered.

If you fail to notify the Engineer promptly, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.

If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

5-1.116B Engineer's Investigation and Decision

Upon your notification, the Engineer investigates job site conditions and:

1. Notifies you whether to resume affected work
2. Decides whether the condition differs materially and is cause for an adjustment of time, payment, or both

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 2-1.11, "Job Site and Document Examination."

Promptly submit supplementary information when obtained.

Replace Section 5-1.14 with:

5-1.14 COST REDUCTION INCENTIVE

Comply with Section 4-1.035B, "Value Engineering Change Proposal."

Add:

5-1.15 DISPUTE RESOLUTION

5-1.15A General

Section 5-1.15, "Dispute Resolution," applies to a contract with 100 or more working days.

In the Dispute Resolution Advisor Agreement and in the Dispute Review Board Agreement, interpret a reference to the special provisions as a reference to the Amendments to the Standard Specifications. In the Dispute Review Board Agreement, replace "Proposal and Contract" with "Bid book." Where the section title does not match the section number for a reference, refer to the referenced title.

5-1.15B Dispute Resolution Advisor

Section 5-1.15B, "Dispute Resolution Advisor," applies to a contract from $3 million to $10 million.

A dispute resolution advisor, hereinafter referred to as "DRA", is chosen by the Department and the Contractor to assist in the resolution of disputes. The DRA is a part of the contract administrative claims 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. The DRA shall not serve as a substitute for filing a protest or a notice of potential claim.

The DRA shall be established by the Department and the Contractor within 30 days of contract approval.

The Department and the Contractor shall each propose 3 potential DRA candidates. Each potential candidate shall provide the Department and the Contractor with their disclosure statement. The disclosure statement shall include a resume of the potential candidate's experience and a declaration statement describing past, present, anticipated, and planned relationships with all parties involved in this contract.

The Department and the Contractor shall select one of the 6 nominees to be the DRA. If the Department and the Contractor cannot agree on one candidate, the Department and the Contractor shall each choose one of the 3 nominated by the other. The final selection of the DRA will be decided by a coin toss between the two candidates.

The Department and the Contractor shall complete and adhere to the Dispute Resolution Advisor Agreement. No DRA meeting shall take place until the Dispute Resolution Advisor Agreement has been signed by all parties, unless all parties agree to sign it at the first meeting.

If DRA needs outside technical services, technical services shall be preapproved by both the Department and the Contractor.

DRA recommendations are nonbinding.

The Contractor shall not use the DRA for disputes between subcontractors or suppliers that have no grounds for a lawsuit against the Department.

DRA replacement is selected in the same manner as the original selection. The appointment of a replacement DRA will begin promptly upon determination of the need for replacement. The Dispute Resolution Advisor Agreement shall be amended to reflect the change of the DRA.

Failure of the Contractor to participate in selecting DRA will result in the withhold of 25 percent of the estimated value of all work performed during each estimate period that the Contractor fails to comply. DRA withholds will be released for payment on the next monthly progress payment following the date that the Contractor has provided assistance in choosing the DRA and no interest will be due the Contractor.

The State and the Contractor shall bear the costs and expenses of the DRA equally.

The DRA shall be compensated at an agreed rate of $1,500 per day for time spent per meeting either at the start of the project or for a dispute. A member serving on more than one State DRA or Dispute Review Board, regardless the number of meetings per day shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel, and incidentals for each day or portion thereof that the DRA is at an authorized DRA meeting.

No additional compensation will be made for time spent by the DRA to review and research activities outside the official DRA meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRA, has been specifically agreed to in advance by the State and Contractor. Time

away from the project that has been specifically agreed to in advance by the Department and the Contractor will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services.

The State will provide conference facilities for DRA meetings at no cost to the Contractor.

The Contractor shall make direct payments to the DRA for participation in authorized meetings and approved hourly rate charges from invoices submitted.

The State will reimburse the Contractor for the State's share of the costs.

There will be no markups applied to expenses associated with the DRA, either by the DRA or by the Contractor when requesting payment of the State's share of DRA expenses. Regardless of the DRA recommendation, neither party will be entitled to reimbursement of DRA costs from the other party.

The Contractor shall submit extra work bills and include invoices with original supporting documents for reimbursement of the State's share.

The cost of technical services will be borne equally by the State and Contractor. There will be no markups for these costs.

A copy of the "Dispute Resolution Advisor Agreement" to be executed by the Contractor, State and the DRA is as follows:

Form CEM 6206 Rev (04-06-07)

DISPUTE RESOLUTION ADVISOR AGREEMENT

_____
(Contract Identification)

Contract No. _____

THIS DISPUTE RESOLUTION ADVISOR AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and _____, the Dispute Resolution Advisor, hereinafter called the "DRA." .

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRA to assist in resolving disputes; and

WHEREAS, the DRA is composed of one person, chosen by the CONTRACTOR and the STATE;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRA hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the timely resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRA. The DRA is to fairly and impartially consider disputes placed before it and provide recommendations for resolution of these disputes to the parties. The DRA shall provide recommendations based on the facts related to the dispute, the contract and applicable laws and regulations. The DRA shall perform the services necessary to participate in the DRA's actions as designated in Section III, Scope of Work.

SECTION II DRA QUALIFICATIONS

DRA shall be knowledgeable in the type of construction and contract documents anticipated by the contract and shall have completed training through the Dispute Review Board Foundation. In addition, it is desirable for the DRA to have served on several State Dispute Review Boards (DRB).

No DRA shall have prior direct involvement in this contract. No DRA shall have a financial interest in this contract or parties thereto, including but not limited to the CONTRACTOR, subcontractors, suppliers, consultants,

and legal and business services, within a period 6 months prior to award and during this contract. Exceptions to above are compensation for services on this or other DRAs and DRBs or retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

DRA shall fully disclose all direct or indirect professional or personal relationships with all key members of the contract.

SECTION III SCOPE OF WORK

The Scope of Work of the DRA includes, but is not limited to, the following:

A. PROCEDURES

The DRA shall meet with the parties at the start of the project to establish procedures that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. The DRA established procedures shall only be implemented upon approval by the parties. Subsequent meetings shall be held only to hear disputes between the parties.

The DRA shall not meet with, or discuss contract issues with individual parties.

State shall provide the DRA with the contract and all written correspondence regarding the dispute between the parties and, if available, the Contractor's supplemental notice of potential claim, and the Engineer's response to the supplemental notice of potential claim.

The parties shall not call the DRA who served on this contract as a witness in arbitration proceedings, which may arise from this contract.

The DRA shall have no claim against the STATE or the CONTRACTOR, or both, from claimed harm arising out of the parties' evaluations of the DRA's opinions.

B. DISPUTE MEETING

The term "dispute meeting" as used in this subsection shall refer to both the informal and traditional dispute meeting processes, unless otherwise noted.

If the CONTRACTOR requests a dispute meeting with the DRA, the Contractor must simultaneously notify the STATE. Upon being notified of the need for a dispute meeting, the DRA shall review and consider the dispute. The DRA shall determine the time and location of the dispute meeting with due consideration for the needs and preferences of the parties, while recognizing the importance of a speedy resolution to the dispute.

Dispute meetings shall be conducted at any location that would be convenient and provide required facilities and access to necessary documentation.

Only the STATE's Resident Engineer or Area Construction Engineer and the CONTRACTOR's or subcontractor's, if the dispute involves a subcontractor, Superintendent or Project Manager may present information at a dispute meeting. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute. The exception to this is technical services, as described below:

> The DRA, with approval of the parties, may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the two parties as specified in an approved contract change order. The CONTRACTOR shall not be entitled to markups for the payments made for these services.

At the dispute meeting the DRA may ask questions, seek clarification, and request further clarification of data presented by either of the parties as may be necessary to assist in making a fully informed recommendation. However, the DRA shall refrain from expressing opinions on the merits of statements on matters under dispute during the parties' presentations. Each party will be given ample time to fully present its position, make rebuttals, provide relevant documents, and respond to DRA questions and requests.

There shall be no testimony under oath or cross-examination, during DRA dispute meetings. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRA in conformance with the rules and regulations established at the first meeting between the DRA and parties. These established rules and regulations need not comply with prescribed legal laws of evidence.

Failure to attend a dispute meeting by either of the parties shall be conclusively considered by the DRA as indication that the non-attending party considers all written documents and correspondence submitted as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals at the meeting until all aspects of the dispute are thoroughly covered.

1. TRADITIONAL DISPUTE MEETING:

The following procedure shall be used for the traditional dispute meeting:

a. Within 5 days, after receiving the STATE's written response to the CONTRACTOR's supplemental notice of potential claim, the CONTRACTOR shall refer the dispute to the DRA, if the CONTRACTOR wishes to further pursue the dispute. The CONTRACTOR shall make the referral in writing to the DRA, simultaneously copied to the STATE. The written dispute referral shall describe the disputed matter in individual discrete segments, so that it will be clear to both parties and the DRA what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.

b. The parties shall each be afforded an opportunity to be present and to be heard by the DRA, and to offer evidence. Either party furnishing written evidence or documentation to the DRA must furnish copies of such information to the other party a minimum of 10 days prior to the date the DRA is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRA may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRA. The DRA shall not consider evidence not furnished in conformance with the terms specified herein.

c. Upon receipt by the DRA of a written referral of a dispute, the DRA shall convene to review and consider the dispute. The dispute meeting shall be held no later than 25 days after receipt of the written referral unless otherwise agreed to by all parties.

d. The DRA shall furnish a written report to both parties. The DRA may request clarifying information of either party within 5 days after the DRA dispute meeting. Requested information shall be submitted to the DRA within 5 days of the DRA request. The DRA shall complete its report and submit it to the parties within 10 days of the DRA dispute meeting, except that time extensions may be granted at the request of the DRA with the written concurrence of both parties. The report shall summarize the facts considered, the contract language, law or regulation viewed by the DRA as pertinent to the dispute, and the DRA's interpretation and philosophy in arriving at its conclusions and recommendations and, if appropriate, recommends guidelines for determining compensation. The DRA's written opinion shall stand on its own, without attachments or appendices.

e. Within 10 days after receiving the DRA's report, both parties shall respond to the DRA in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRA's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRA recommendation. Immediately after responses have been received from both parties, the DRA shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRA's report from the DRA prior to responding to the report. The DRA shall consider any clarification request only if submitted within 5 days of receipt of the DRA's report, and if submitted simultaneously in writing to both the DRA and the other party. Each party may submit only one request for clarification for any individual DRA report. The DRA shall respond, in writing, to requests for clarification within 5 days of receipt of such requests.

f. Either party may seek a reconsideration of the DRA's recommendation. The DRA shall only grant reconsideration based upon submission of new evidence and if the request is submitted within the 10 day time limit specified for response to the DRA's written report. Each party may submit only one request for reconsideration regarding an individual DRA recommendation.

g. If the parties are able to settle their dispute with the aid of the DRA's report, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties. If the parties cannot agree on compensation within 30 days of the acceptance by both parties of the settlement, either party may request the DRA to make a recommendation regarding compensation.

2. INFORMAL DISPUTE MEETING

An informal dispute meeting shall be convened, only if, the parties and the DRA agree that this dispute resolution process is appropriate to settle the dispute.

The following procedure shall be used for the informal dispute meeting:

a. The parties shall furnish the DRA with one copy of pertinent documents requested by the DRA that are or may become necessary for the DRA to perform its function. The party furnishing documents shall furnish such documents to the other party at the same time the document is provided to the DRA.
b. After the dispute meeting has concluded; the DRA shall deliberate in private the same day, until a response to the parties is reached or as otherwise agreed to by the parties.
c. The DRA then verbally delivers its recommendation with findings to the parties.
d. After the recommendation is presented, the parties may ask for clarifications.
e. Occasionally the DRA on complex issues may be unable to formulate a recommendation based on the information given at a dispute meeting. However, the DRA may provide the parties with advice on strengths and weaknesses of their prospective positions, in the hope of the parties reaching settlement.
f. If the parties are able to settle their dispute with the aid of the DRA's opinion, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties.
g. The DRA will not be bound by its oral recommendation in the event that a dispute is later heard by the DRA in a traditional dispute meeting.

Unless the dispute is settled, use of the informal dispute meeting does not relive the parties of their responsibilities under Section 5-1.12, "Dispute Resolution Advisor," of the Special Provisions or Subsection, "Traditional Dispute Meeting," of this AGREEMENT. There will be no extension of time allowed for the process to permit the use of the informal dispute meeting, unless otherwise agreed to by the parties.

SECTION IV TIME FOR BEGINNING AND COMPLETION

Once established, the DRA shall be in operation until the day the Director accepts the contract. The DRA shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE or as agreed to by the parties.

SECTION V PAYMENT

DRA shall be compensated at an agreed rate of $1,500 per day for time spent per meeting, either at the start of the project or for a dispute. A member serving on more than one State DRA or DRB, regardless the number of meetings per day, shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for onsite time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof that the DRA is at an authorized DRA meeting. No additional compensation will be made for time spent by DRA to review and research activities outside the official DRA meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRA), has been specifically agreed to in advance by the parties. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services. The State will provide administrative services such as conference facilities to the DRA.

A. PAYMENT PROCESSING

CONTRACTOR shall make direct payments to DRA for their participation in authorized meetings and approved hourly rate charges, from invoices submitted by the DRA, and technical services.

DRA may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRA until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

B. INSPECTION OF COSTS RECORDS

DRA and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VI ASSIGNMENT OF TASKS OF WORK

DRA shall not assign the work of this AGREEMENT.

SECTION VII TERMINATION OF A DRA MEMBER

DRA may resign after providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. The DRA may be terminated, by either party, for failing to fully comply at all times with all required employment or financial disclosure conditions of DRA membership in conformance with the terms of the contract and this AGREEMENT. Each party shall document the need for replacement and substantiate the replacement request in writing to the other party and the DRA.

SECTION VIII LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRA in the performance of duties is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRA from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRA.

SECTION IX CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRA, which documents and records are marked "Confidential - for use by the DRA only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRA findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of this AGREEMENT. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRA. However, the parties understand that such documents may be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION X DISPUTES

Disputes between the parties arising out of the work or other terms of this AGREEMENT that cannot be resolved by negotiation and mutual concurrence between the parties or through the administrative process provided in the contract shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications. Disputes between the DRA and the parties that cannot be resolved by negotiation and mutual concurrence shall be resolved in the appropriate forum.

SECTION XI VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including the DRA, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRA in progress, except for private meetings or deliberations of the DRA.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIII CERTIFICATION OF CONTRACTOR, DRA, AND STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRA

By: _____

Title: _____

CONTRACTOR

By: _____

Title: _____

CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION

By: _____

Title: _____

5-1.15C Dispute Review Board

- Section 5-1.15C, "Dispute Review Board," applies to a contract over $10 million.

5-1.15C(1) 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.

5-1.15C(2) 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 3 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.

5-1.15C(3) 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.

5-1.15C(4) 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 2 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.

5-1.15C(5) 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.

5-1.15C(6) 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.

5-1.15C(7) 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:

Form 6202 Rev (09/01/02)

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

By: _____

Title: _____

DRB MEMBER

By: _____

Title : _____

DRB MEMBER

By : _____

Title : _____

CONTRACTOR

By: _____

Title: _____

CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION

By: _____

Title: _____

Add:

5-1.16–5-17 (BLANK)

Add:

5-1.18 PROPERTY AND FACILITY PRESERVATION

5-1.18A General

Preserve property and facilities, including:

1. Adjacent property
2. Department's instrumentation
3. ESAs
4. Lands administered by other agencies
5. Railroads and railroad equipment
6. Roadside vegetation not to be removed
7. Utilities
8. Waterways

Immediately report damage to the Engineer.

If you cause damage, you are responsible.

Install sheet piling, cribbing, bulkheads, shores, or other supports necessary to support existing facilities or support material carrying the facilities.

Dispose of temporary facilities when they are no longer needed.

If you damage plants not to be removed:

1. Dispose of them outside the right of way unless the Engineer allows you to reduce them to chips and spread the chips within the highway at locations designated by the Engineer
2. Replace them

Replace plants with plants of the same species.

Replace trees with 600 mm-box trees.

Replace shrubs with No. 15 container shrubs.

Replace ground cover plants with plants from flats. Replace Carpobrutus ground cover plants with plants from cuttings. Plant ground cover plants 300 mm on center.

If a plant establishment period is specified, replace plants before the start of the plant establishment period; otherwise, replace plants at least 30 days before Contract acceptance.

Water each plant immediately after planting and saturate the backfill soil around and below the roots or ball of earth around the roots of each plant. Water as necessary to maintain plants in a healthy condition until Contract acceptance.

The Department may make a temporary repair to restore service to a damaged facility.

If working on or adjacent to railroad property, do not interfere with railroad operations.

For an excavation on or affecting railroad property, submit work plans showing the system to be used to protect railroad facilities. Allow 65 days for the Engineer's review of the plans. Do not perform work based on the plans until the Engineer notifies you they are accepted.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in protecting or repairing property as specified in this section is included in the prices paid for the various contract items of work and no additional compensation will be allowed.

5-1.18B Nonhighway Facilities (Including Utilities)

The Department may rearrange a nonhighway facility during the Contract. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility.The Department may authorize facility owners and their agents to enter the highway to perform rearrangement work for their facilities or to make connections or repairs to their property. Coordinate activities to avoid delays.

Notify the Engineer at least 3 business days before you contact the regional notification center under Govt Code § 4216 et seq. Failure to contact the notification center prohibits excavation.

Before starting work that could damage or interfere with underground infrastructure, locate the infrastructure described in the Contract, including laterals and other appurtenances, and determine the presence of other underground infrastructure inferred from visible facilities such as buildings, meters, or junction boxes.

Notify the Engineer if the infrastructure described in the Contract cannot be found. If after giving the notice, you find the infrastructure in a substantially different location than described, finding the infrastructure is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Underground infrastructure described in the Contract may be in different locations than described, and additional infrastructure may exist.

Upon discovering an underground main or trunk line not described in the Contract, immediately notify the Engineer and the infrastructure owner. The Engineer orders the locating and protecting of the infrastructure. The locating and protecting is paid for as extra work as specified in Section 4-1.03D, "Extra Work." If ordered, repair infrastructure damage. If the damage is not due to your negligence, the repair is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If necessary underground infrastructure rearrangement is not described in the Contract, the Engineer may order you to perform the work. The rearrangement is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If you want infrastructure rearrangement different from that described in the Contract:

1. Notify the Engineer
2. Make an arrangement with the infrastructure owner
3. Obtain authorization for the rearrangement
4. The Department does not adjust time or payment for rearrangement different from the Contract
5. Pay the infrastructure owner any additional cost

Immediately notify the Engineer of a delay due to the presence of main line underground infrastructure not described in the Contract or in a substantially different location or due to rearrangement different from the Contract.

The Department pays for one of these delays in the same manner as specified for a right of way delay in Section 8-1.09, "Right of Way Delays."

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SECTION 6 CONTROL OF MATERIALS
(Issued 07-01-08)

Replace Section 6-1.05 with:

6-1.05 Specific Brand or Trade Name and Substitution

A reference to a specific brand or trade name establishes a quality standard and is not intended to limit competition. You may use a product that is equal to or better than the specified brand or trade name if approved.

Submit a substitution request within a time period that:

1. Follows Contract award
2. Allows 30 days for review
3. Causes no delay

Include substantiating data with the substitution request that proves the substitution:

1. Is of equal or better quality and suitability
2. Causes no delay in product delivery and installation

Add:

6-1.075 GUARANTEE

Guarantee the work remains free from substantial defects for 1 year after contract acceptance except for work parts for which you were relieved of maintenance and protection. Guarantee each of these relieved work parts for 1 year after the relief date.

The guarantee excludes damage or displacement caused by an event outside your control including:

1. Normal wear and tear
2. Improper operation
3. Insufficient maintenance
4. Abuse
5. Unauthorized change
6. Act of God

During the guarantee period, repair or replace each work portion having a substantial defect.

The Department does not pay for corrective work.

During corrective work activities, provide insurance coverage specified for coverage before contract acceptance.

The contract bonds must be in full force and effect until the later of:

1. Expiration of guarantee period
2. Completion of corrective work

If a warranty specification conflicts with Section 6-1.075, "Guarantee," comply with the warranty specification.

During the guarantee period, the Engineer monitors the completed work. If the Engineer finds work having a substantial defect, the Engineer lists work parts and furnishes you the list.

Within 10 days of receipt of the list, submit for authorization a detailed plan for correcting the work. Include a schedule that includes:

1. Start and completion dates
2. List of labor, equipment, materials, and any special services you plan to use

3. Work related to the corrective work, including traffic control and temporary and permanent pavement markings

The Engineer notifies you when the plan is authorized. Start corrective work and related work within 15 days of notice.

If the Engineer determines corrective work is urgently required to prevent injury or property damage:

1. The Engineer furnishes you a request to start emergency repair work and a list of parts requiring corrective work
2. Mobilize within 24 hours and start work
3. Submit a corrective work plan within 5 days of starting emergency repair work

If you fail to perform work as specified, the Department may perform the work and bill you.

Add:

6-1.085 BUY AMERICA (23 CFR 635.410)

For a Federal-aid contract, furnish steel and iron materials to be incorporated into the work that are produced in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)]
2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or $2 500, material produced outside the United States may be used

Production includes:

1. Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition
2. Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials

For steel and iron materials to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies all production processes occurred in the United States except for the above exceptions.

Add:

6-1.087 BUY AMERICA (PUB RES CODE § 42703(d))

Furnish crumb rubber to be incorporated into the work that is produced in the United States and is derived from waste tires taken from vehicles owned and operated in the United States.

For crumb rubber to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies only crumb rubber manufactured in the United States and derived from waste tires taken from vehicles owned and operated in the United States is used.

In Section 6-2.01 delete the 4th paragraph.

In Section 6-2.01 replace the 7th paragraph with:

Upon the Contractor's written request, the Department tests materials from an untested local source. If satisfactory material from that source is used in the work, the Department does not charge the Contractor for the tests; otherwise, the Department deducts the test cost.

In Section 6-2.01 delete the 8th paragraph.

In Section 6-2.02 delete the 3rd paragraph.

In Section 6-2.02 in the 7th paragraph, replace the 2nd sentence with:

The Department deducts the charges for the removed material.

In Section 6-3.01 delete the 4th paragraph.

In Section 6-3.01 in the 6th paragraph, delete the 1st sentence.

In Section 6-3.01 add:

As used in Section 6-3.01, "Testing," tests are tests to assure the quality and to determine the acceptability of the work.

The Department deducts costs of testing work found to be noncompliant.

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SECTION 7 LEGAL RELATIONS AND RESPONSIBILITY
(Issued 09-25-09)

Replace Section 7-1.01 with:

7-1.01 LAWS TO BE OBSERVED

Comply with laws, regulations, orders, decrees, and PLACs applicable to the project. Indemnify and defend the State against any claim or liability arising from the violation of a law, regulation, order, decree, or PLAC by you or your employees. Immediately report to the Engineer in writing a discrepancy or inconsistency between the contract and a law, regulation, order, decree, or PLAC.

In Section 7-1.01A replace the 1st clause with:

Work on the job site must comply with Labor Code §§ 1727 and 1770-1815 and 8 CA Code of Regs § 16000 et seq. Work includes roadside production and processing of materials.

In Section 7-1.01A(2) in the 1st paragraph, replace item 3 with:

3. Upon becoming aware of the subcontractor's failure to pay the specified prevailing rate of wages to the subcontractor's workers, the Contractor must diligently take corrective action to stop or rectify the failure, including withholding sufficient funds due the subcontractor for work performed on the public works project.

In Section 7-1.01A(2) replace the 2nd paragraph with:

Pursuant to Section 1775 of the Labor Code, the Division of Labor Standards Enforcement must notify the Contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages. If the Division of Labor Standards Enforcement determines that employees of a subcontractor were not paid the general prevailing rate of per diem wages and if the Department did not withhold sufficient money under the contract to pay those employees the balance of wages owed under the general prevailing rate of per diem wages, the Contractor must withhold an amount of moneys due the subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor must pay any money withheld from and owed to a subcontractor upon receipt of

notification by the Division of Labor Standards Enforcement that the wage complaint has been resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within 180 days of the filing of a valid notice of completion or acceptance of the public works project, whichever occurs later, the Contractor must pay all moneys withheld from the subcontractor to the Department. The Department withholds these moneys pending the final decision of an enforcement action.

In Section 7-1.01A(2) replace the 7th paragraph with:

Changes in general prevailing wage determinations apply to the contract when the Director of Industrial Relations has issued them at least 10 days before advertisement (Labor Code § 1773.6 and 8 CA Code of Regs 16204).

In Section 7-1.01A(3) replace the 2nd paragraph with:

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

In Section 7-1.01A(3) replace the 4th paragraph with:

The Department withholds for delinquent or inadequate payroll records (Labor Code § 1771.5). If the Contractor has not submitted an adequate payroll record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than $10 000 or less than $1000.

In Section 7-1.01A(3) delete the 5th paragraph.

Replace Section 7-1.01A(6) with:

7-1.01A(6) (Blank)

Add:

7-1.01K Solid Waste Disposal and Recycling

Submit an annual Solid Waste Disposal and Recycling Report between January 1 and 15 for each year work is performed under the Contract at any time during the previous calendar year. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 through December 31 of the previous calendar year.

Submit a final annual Solid Waste Disposal and Recycling Report within 5 business days after Contract acceptance. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 to contract acceptance.

For each failure to submit a completed form, the Department withholds $10,000.

Add:

7-1.01L Asbestos and Hazardous Substances

- Upon discovery, immediately stop working in and notify the Engineer of areas where asbestos or a hazardous substance is present if the:

1. Contractor reasonably believes the substance is asbestos as defined in Labor Code § 6501.7 or a hazardous substance as defined in Health & Safety Code §§ 25316 and 25317
2. Presence is not described in the contract
3. Substance has not been made harmless

Add:

7-1.01M Archaeological Discoveries

If archaeological materials are discovered at the job site, protect and leave them undisturbed in place and comply with:

1. Pub Res Code §§ 5097.5, 5097.98, and 5097.99
2. 14 CA Code of Regs § 4308
4. Penal Code § 622-1/2
5. Health & Safety Code § 7050.5

Archaeological materials are the remains of past human activity including historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not archaeological materials unless they show direct evidence of human use or alteration or when found in direct physical association with archaeological materials

Historic-period archaeological materials include cultural remains beginning with initial European contact in California but at least 50 years old and 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
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
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovering archaeological materials, stop all work within an 18.5-meter radius of the archaeological materials and notify the Engineer. Archaeological materials discovered are the property of the State. Do not resume work within the 18.5-meter radius of the discovery 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 discovery 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 discovery. If ordered by the Engineer furnish labor, material, tools, and equipment to secure the location of the discovery and assist in the investigation or recovery of archaeological materials; the cost of this work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

In Section 7-1.02 in the 2nd paragraph, replace the 4th sentence with:

Trucks used to haul treated base, portland cement concrete, or hot mix asphalt shall enter onto the base to dump at the nearest practical entry point ahead of spreading equipment.

In Section 7-1.02 between the 4th and 5th paragraphs, add:

Loads imposed on existing, new, or partially completed structures shall not exceed the load carrying capacity of the structure or any portion of the structure as determined by AASHTO LRFD with interims and California Amendments, Design Strength Limit State II. The compressive strength of concrete (f'_c) to be used in computing the load carrying capacity shall be the smaller of the following:

1. Actual compressive strength at the time of loading

2. Value of f'_c shown on the plans for that portion of the structure or 2.5 times the value of f_c (extreme fiber compressive stress in concrete at service loads) shown on the plans for portions of the structure where no f'_c is shown

In Section 7-1.06 in the 1st paragraph, add:

The Contractor's Injury and Illness Prevention Program shall be submitted to the Engineer. The program shall address the use of personal and company issued electronic devices during work. The use of entertainment and personal communication devices in the work zone shall not be allowed. Workers may use a communication device for business purposes in the work area, at a location where their safety and the safety of other workers and the traveling public is not compromised.

In Section 7-1.09 replace the 8th paragraph with:

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 except where a discrepancy exists between the California MUTCD and the specifications; for discrepancies, comply with the specifications. 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.

In Section 7-1.09 replace the 14th paragraph with:

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).

In Section 7-1.09 replace the 16th paragraph with:

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.

Add to Section 7-1.09:

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 4:1 (horizontal:vertical).
   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.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

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.

Replace Section 7-1.11 with:

7-1.11 PRESERVATION OF PROPERTY

Comply with Section 5-1.18, "Property and Facility Preservation."

Replace Section 7-1.12 with:

7-1.12 INDEMNIFICATION AND INSURANCE

The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 3-1.05, "Insurance Policies," and Sections 7-1.12A, "Indemnification," and 7-1.12B, "Insurance," of this Section 7-1.12.

7-1.12A Indemnification

The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 7-1.12A Claims) arising out of or in connection with the Contractor's performance of this contract for:

1. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
2. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.

Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. State inspection is not a waiver of full compliance with these requirements.

The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

7-1.12B Insurance

7-1.12B(1) General

Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.12B(2) Casualty Insurance

The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

1. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.
2. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
3. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.15.

7-1.12B(3) Workers' Compensation and Employer's Liability Insurance

In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

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

Contract execution constitutes certification submittal.

The Contractor shall provide Employer's Liability Insurance in amounts not less than:

1. $1 000 000 for each accident for bodily injury by accident
2. $1 000 000 policy limit for bodily injury by disease
3. $1 000 000 for each employee for bodily injury by disease

If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

7-1.12B(4) Liability Insurance

7-1.12B(4)(a) General

The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations, and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

7-1.12B(4)(b) Liability Limits/Additional Insureds

The limits of liability shall be at least the amounts shown in the following table:

Total Bid	For Each Occurrence[1]	Aggregate for Products/Completed Operation	General Aggregate[2]	Umbrella or Excess Liability[3]
≤$1 000 000	$1 000 000	$2 000 000	$2 000 000	$5 000 000
>$1 000 000 ≤$10 000 000	$1 000 000	$2 000 000	$2 000 000	$10 000 000
>$10 000 000 ≤$25 000 000	$2 000 000	$2 000 000	$4 000 000	$15 000 000
>$25 000 000	$2 000 000	$2 000 000	$4 000 000	$25 000 000

1. Combined single limit for bodily injury and property damage.
2. This limit shall apply separately to the Contractor's work under this contract.
3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

The Contractor shall not require certified Small Business subcontractors to carry Liability Insurance that exceeds the limits in the table above. Notwithstanding the limits specified herein, at the option of the Contractor, the liability insurance limits for certified Small Business subcontractors of any tier may be less than those limits specified in the table. For Small Business subcontracts, "Total Bid" shall be interpreted as the amount of subcontracted work to a certified Small Business.

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
3. To the extent prohibited by Insurance Code Section 11580.04

Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

7-1.12B(4)(c) Contractor's Insurance Policy is Primary

The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

7-1.12B(5) Automobile Liability Insurance

The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than $1 000 000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 7-1.12B(4)(b) also applies to automobile liability.

7-1.12B(6) Policy Forms, Endorsements, and Certificates

The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

7-1.12B(7) Deductibles

The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 7-1.12B, "Insurance."

7-1.12B(8) Enforcement

The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 8-1.08, "Termination of Control."

The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

7-1.12B(9) Self-Insurance

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

In Section 7-1.13 delete the 5th and 6th paragraphs.

Add:

7-1.50 FEDERAL LAWS FOR FEDERAL-AID CONTRACTS

7-1.50A General

Section 7-1.50, "Federal Laws for Federal-Aid Contracts," includes specifications required in a Federal-aid construction contract and applies to a Federal-aid contract.

Form FHWA-1273 is included in the contract in Section 7-1.50B, "FHWA-1273." Some contract terms on the form are different than those used in other contract parts as shown in the following table:

FHWA-1273 Terms and Department Equivalencies

FHWA-1273 Term	Equivalent Term Used in Other Contract Parts
SHA	Department
SHA contracting officer	Engineer
SHA resident engineer	Engineer

7-1.50B FHWA-1273

FHWA-1273 Electronic version -- March 10, 1994
with revised Section VI

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Nonsegregated Facilities
IV. Payment of Predetermined Minimum Wage
V. Statements and Payrolls
VI. Record of Materials, Supplies, and Labor
VII. Subletting or Assigning the Contract
VIII. Safety: Accident Prevention
IX. False Statements Concerning Highway Projects
X. Implementation of Clean Air Act and Federal Water Pollution Control Act
XI. Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
XII. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

   Section I, paragraph 2;
   Section IV, paragraphs 1, 2, 3, 4, and 7;
   Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:

   a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
   b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 *et seq.*) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

   a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
   b. The contractor will accept as his operating policy the following statement:

      "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where

implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. **Training and Promotion:**

   a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
   c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
   d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. **Unions**: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

   a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
   b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
   c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these specifications, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

   a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
   b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
   c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

   a. The records kept by the contractor shall document the following:

      1. The number of minority and non-minority group members and women employed in each work classification on the project;
      2. The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
      3. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
      4. The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

   b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.
b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact,

segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. **General:**

   a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis- Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

   b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

   c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. **Classification:**

   a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

   b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

      1. the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
      2. the additional classification is utilized in the area by the construction industry;
      3. the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
      4. with respect to helpers, when such a classification prevails in the area in which the work is performed.

   c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL,

Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. **Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. **Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

1. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
2. The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
3. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a

different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

4. In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

1. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
2. The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
3. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
4. In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as

may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. **Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. **Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. **Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

   1. that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
   2. that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
   3. that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

(As of May 22, 2007, Form FHWA-47 is no longer required.)

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

   a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

   b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by Engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;
Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)
By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 *et seq*., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 *et seq*., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. **Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

   a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
   b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
   c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
   d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

2. **Instructions for Certification - Lower Tier Covered Transactions:**

   (Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)
   a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
   b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier

participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

*** * * * ***

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in

connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

7-1.50C Female and Minority Goals

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the Department is including in Section 7-1.50C, "Female and Minority Goals," female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed $10,000.

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization [45 Fed Reg 65984 (10/3/1980)] are as follows:

Minority Utilization Goals

	Economic Area	Goal (Percent)
174	Redding CA: Non-SMSA Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehema	6.8
175	Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo 7400 San Jose, CA CA Santa Clara, CA 7485 Santa Cruz, CA CA Santa Cruz 7500 Santa Rosa CA Sonoma 8720 Vallejo-Fairfield-Napa, CA CA Napa; CA Solano Non-SMSA Counties: CA Lake; CA Mendocino; CA San Benito	 28.9 25.6 19.6 14.9 9.1 17.1 23.2
177	Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba	 16.1 14.3
178	Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus 8120 Stockton, CA CA San Joaquin Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Toulumne	 12.3 24.3 19.8
179	Fresno-Bakersfield, CA SMSA Counties: 0680 Bakersfield, CA CA Kern 2840 Fresno, CA CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare	 19.1 26.1 23.6
180	Los Angeles, CA: SMSA Counties: 0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange 4480 Los Angeles-Long Beach, CA CA Los Angeles 6000 Oxnard-Simi Valley-Ventura, CA CA Ventura 6780 Riverside-San Bernardino-Ontario, CA	 11.9 28.3 21.5 19.0

	CA Riverside; CA San Bernardino 7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo	 19.7 24.6
181	San Diego, CA: SMSA Counties 7320 San Diego, CA CA San Diego Non-SMSA Counties CA Imperial	 16.9 18.2

For each July during which work is performed under the contract, you and each non-material-supplier subcontractor with a subcontract of $10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

7-1.50D Training

Section 7-1.50D, "Training," applies if a number of trainees or apprentices is specified in the special provisions.

As part of your equal opportunity affirmative action program, provide on-the-job training to develop full journeymen in the types of trades or job classifications involved.

You have primary responsibility for meeting this training requirement.

If you subcontract a contract part, determine how many trainees or apprentices are to be trained by the subcontractor.

Include these training requirements in your subcontract.

Where feasible, 25 percent of apprentices or trainees in each occupation must be in their 1st year of apprenticeship or training.

Distribute the number of apprentices or trainees among the work classifications on the basis of your needs and the availability of journeymen in the various classifications within a reasonable recruitment area.

Before starting work, submit to the Department:

1. Number of apprentices or trainees to be trained for each classification
2. Training program to be used
3. Training starting date for each classification

Obtain the Department's approval for this submitted information before you start work. The Department credits you for each apprentice or trainee you employ on the work who is currently enrolled or becomes enrolled in an approved program.

The primary objective of Section 7-1.50D, "Training," is to train and upgrade minorities and women toward journeymen status. Make every effort to enroll minority and women apprentices or trainees, such as conducting systematic and direct recruitment through public and private sources likely to yield minority and women apprentices or trainees, to the extent they are available within a reasonable recruitment area. Show that you have made the efforts. In making these efforts, do not discriminate against any applicant for training.

Do not employ as an apprentice or trainee an employee:

1. In any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman
2. Who is not registered in a program approved by the US Department of Labor, Bureau of Apprenticeship and Training

Ask the employee if the employee has successfully completed a training course leading to journeyman status or has been employed as a journeyman. Your records must show the employee's answers to the questions.

In your training program, establish the minimum length and training type for each classification. The Department and FHWA approves a program if one of the following is met:

1. It is calculated to:

    1.1. Meet the your equal employment opportunity responsibilities
    1.2. Qualify the average apprentice or trainee for journeyman status in the classification involved by the end of the training period

2. It is registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training and it is administered in a way consistent with the equal employment responsibilities of federal-aid highway construction contracts

Obtain the State's approval for your training program before you start work involving the classification covered by the program.

Provide training in the construction crafts, not in clerk-typist or secretarial-type positions. Training is allowed in lower level management positions such as office engineers, estimators, and timekeepers if the training is oriented toward construction applications. Training is allowed in the laborer classification if significant and meaningful training is provided and approved by the division office. Off-site training is allowed if the training is an integral part of an approved training program and does not make up a significant part of the overall training.

The Department reimburses you 80 cents per hour of training given an employee on this contract under an approved training program:

1. For on-site training
2. For off-site training if the apprentice or trainee is currently employed on a federal-aid project and you do at least one of the following:

    2.1. Contribute to the cost of the training
    2.2. Provide the instruction to the apprentice or trainee
    2.3. Pay the apprentice's or trainee's wages during the off-site training period

3. If you comply with Section 7-1.50D, "Training"

Each apprentice or trainee must:

1. Begin training on the project as soon as feasible after the start of work involving the apprentice's or trainee's skill
2. Remain on the project as long as training opportunities exist in the apprentice's or trainee's work classification or until the apprentice or trainee has completed the training program

Furnish the apprentice or trainee:

1. Copy of the program you will comply with in providing the training
2. Certification showing the type and length of training satisfactorily completed

Maintain records and submit reports documenting your performance under Section 7-1.50D, "Training."

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SECTION 8 PROSECUTION AND PROGRESS
(Issued 07-01-08)

Replace Section 8-1.01 with:

8-1.01 (Blank)

In Section 8-1.02 replace the 2nd paragraph with:

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.

Add to Section 8-1.08:

For a Federal-aid contract, the Department may terminate your control of the work for failure to include "Required Contract Provisions, Federal-Aid Construction Contracts" in subcontracts.

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SECTION 9 MEASUREMENT AND PAYMENT
(Issued 03-11-10)

In Section 9-1.02 in the 1st paragraph, replace the last sentence with:

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.

Add to Section 9-1.02:

The Department pays 10 percent per year interest for unpaid and undisputed:

1. Progress payments
2. After-acceptance payment except for claims

For these payments, interest starts to accrue 30 days after the 1st working day following the 20th day of the month payment is due. For extra work bills not submitted within 7 days after performing the work as specified in 5-1.015E, "Extra Work Bills," interest starts to accrue 60 days after the 1st working day following the 20th day of the month payment is due.

The Department pays 6 percent per year interest for accepted claims. Interest starts to accrue 61 days after the Department accepts a Final Claim Statement.

The Department pays 6 percent per year interest for awards in arbitration (Civ Code § 3289).

If the amount of a deduction or withhold exceeds final payment, the Department invoices you for the difference, to be paid upon receipt.

In Section 9-1.03A replace the 2nd paragraph with:

To the total of the direct costs computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," there will be added a markup of 35 percent to the cost of labor, 15 percent to the cost of materials, and 15 percent to the cost of equipment rental.

In Section 9-1.03A replace the 3rd and 4th paragraphs with:

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.

If a subcontractor performs work at force account, accept an additional 10 percent markup to the total cost of that work paid at force account, including markups specified in Section 9-1.03, "Force Account Payment," as reimbursement for additional administrative costs.

Replace Section 9-1.03B with:

The Contractor, and all subcontractors obtained before or after contract execution, shall itemize the labor, material, and equipment rental costs, and shall not be deemed specialists unless the selected Contractor or available subcontractors on site are not capable of performing the specialty work and it is not the special service industry's established practice to provide cost itemization. In addition, the Engineer may approve work required to be performed at an off-site manufacturing plant or machine shop to be paid as a non-itemized specialist billing. To obtain approval as a specialist, the Contractor shall submit on behalf of the subcontractor a request to the Engineer prior to the start of the proposed specialist work.

If approval is granted, the Engineer will accept the non-itemized invoices for specialty work performed, provided the invoices are at current market rates. Markup percentages of Section 9-1.03A, "Work Performed by Contractor," will not apply. A markup of 10 percent will be added to the total cost of the extra work. The 10 percent markup shall reimburse the Contractor for additional administrative costs, and no other payment will be made by reason of performance of the extra work by a specialist.

If approval is not granted prior to the start of the proposed specialty work, the Contractor or subcontractor shall itemize labor, material, and equipment rental costs and apply percentage markups as required by Section 9-1.03A, "Work Performed by Contractor."

In Section 9-1.03C delete the 6th paragraph.

Replace Section 9-1.04 with:

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.

Replace Section 9-1.05 with:

9-1.05 STOP NOTICE WITHHOLDS

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

Stop notice information may be obtained from the Office of External Accounts Payable, Division of Accounting.

Add:

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.

Add:

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.

Add:

9-1.057 PROGRESS WITHHOLDS

The Department withholds 10 percent of a partial payment for noncompliant progress. Noncompliant progress occurs when:

1. Total days to date exceed 75 percent of the revised contract working days
2. Percent of working days elapsed exceeds the percent of value of work completed by more than 15 percent

The Engineer determines the percent of working days elapsed by dividing the total days to date by the revised contract working days and converting the quotient to a percentage.

The Engineer determines the percent of value of work completed by summing payments made to date and the amount due on the current progress estimate, dividing this sum by the current total estimated value of the work, and converting the quotient to a percentage. These amounts are shown on the Progress Payment Voucher.

When the percent of working days elapsed minus the percent of value of work completed is less than or equal to 15 percent, the Department returns the withhold in the next progress payment.

In Section 9-1.06 in the 4th paragraph, replace the 1st sentence with:

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.

In Section 9-1.065 replace the title and the 1st and 2nd paragraphs with:

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

In Section 9-1.07A replace the 2nd sentence with:

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.

Replace Section 9-1.07B with:

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.

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SECTION 12 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES
(Issued 10-06-06)

In Section 12-1.01 replace the 2nd paragraph with:

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.

Replace Section 12-2.01 with:

12-2.01 FLAGGERS

Flaggers while on duty and assigned to traffic control or to give warning to the public that the highway is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties and shall be provided with the necessary equipment in conformance with Part 6 of the California MUTCD. The equipment shall be furnished and kept clean and in good repair by the Contractor at the Contractor's expense.

In Section 12-3.01 replace the 1st paragraph with:

In addition to the requirements in Part 6 of the California MUTCD, all devices used by the Contractor in the performance of the work shall conform to the provisions in this Section 12-3.

In Section 12-3.01 replace the 5th paragraph with:

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

In Section 12-3.06 replace the 1st paragraph with:

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.

In Section 12-3.06 replace the 4th paragraph with:

All construction area signs shall conform to the dimensions, color and legend requirements of the plans, Part 6 of the California MUTCD and these specifications. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these specifications.

In Section 12-3.06 replace the 8th paragraph with:

Used signs with the specified sheeting material will be considered satisfactory if they conform to the requirements for visibility and legibility and the colors conform to the requirements in Part 6 of the California MUTCD. 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.

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SECTION 15 EXISTING HIGHWAY FACILITIES
(Issued 11-02-04)

In Section 15-2.07 replace the 6th paragraph with:

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 thrie 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
(Issued 01-02-09)

Replace Section 19-1.02 with:

19-1.02 (BLANK)

Replace Section 19-1.03 with:

19-1.03 GRADE TOLERANCE

Immediately prior to placing subsequent layers of material thereon, the grading plane shall conform to one of the following:

A. When hot mix asphalt is to be placed on the grading plane, the grading plane at any point shall not vary more than 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.

In Section 19-3.025C replace the 1st paragraph with:

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

In Section 19-3.025C replace the 4th paragraph with:

The aggregate, cementitious material, and water shall be proportioned either by 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.

In Section 19-3.062 replace the 1st paragraph with:

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

In Section 19-3.062 replace the 5th paragraph with:

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

In Section 19-3.062 replace the 8th paragraph with:

The aggregate, cementitious material, and water shall be proportioned either by 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
(Issued 08-17-07)

Replace Section 20-2.03 with:

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 contaminates. 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.

In Section 20-2.10 delete the 8th, 9th, and 10th paragraphs.

Replace Section 20-2.25 with:

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.

In Section 20-3.04A delete the last paragraph.

Replace Section 20-4.055 with:

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.

Replace Section 20-5.03J with:

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
(Issued 02-16-07)

In Section 25-1.02A replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

    5.1. Asphalt concrete
    5.2. Portland cement concrete
    5.3. Lean concrete base
    5.4. Cement treated base

Replace Section 25-1.02B with:

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
(Issued 02-16-07)

In Section 26-1.02A replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

    5.1. Asphalt concrete
    5.2. Portland cement concrete
    5.3. Lean concrete base
    5.4. Cement treated base

In Section 26-1.02B replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

    5.1. Asphalt concrete
    5.2. Portland cement concrete
    5.3. Lean concrete base
    5.4. Cement treated base

^^

SECTION 27 CEMENT TREATED BASES
(Issued 07-31-07)

In Section 27-1.02 replace the 1st paragraph with:

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

In Section 27-1.02 replace the 3rd and 4th paragraphs with:

Aggregate for use in Class A cement treated base shall be of such quality that when mixed with cement in an amount not to exceed 5 percent by 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.

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.

In Section 27-1.07 replace the 9th paragraph with:

When surfacing material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as surfacing. This filling shall be done as a separate operation prior to placing the lowest layer of surfacing, and full compensation for this filling will be considered as included in the contract price paid for cement treated base and no additional compensation will be allowed therefor.

^^

SECTION 28 LEAN CONCRETE BASE
(Issued 07-31-07)

In Section 28-1.02 replace the 1st paragraph with:

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

In Section 28-1.02 replace the 6th paragraph with:

Aggregate shall be of such quality that, when mixed with cement in an amount not to exceed 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.

In Section 28-1.06 replace the 2nd paragraph with:

In advance of curing operations, lean concrete base to be surfaced with hot mix asphalt shall be textured with a drag strip of burlap, a broom or a spring steel tine device which will produce scoring in the finished surface. The scoring shall be parallel with the centerline or transverse thereto. The operation shall be performed at a time and in a manner to produce the coarsest texture practical for the method used.

In Section 28-1.08 replace the 2nd paragraph with:

Hardened lean concrete base with a surface lower than 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
(Issued 07-31-07)

In Section 29-1.02A replace the 4th paragraph with:

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

In Section 29-1.02B replace the 2nd paragraph with:

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

In Section 29-1.04A replace the 1st paragraph with:

Aggregates and asphalt for asphalt treated permeable base shall be stored, proportioned and mixed in the same manner provided for storing, proportioning and mixing aggregates and asphalt for hot mix asphalt in Section 39-1.08, "Production," except as follows:

1. The aggregate need not be separated into sizes.
2. The temperature of the aggregate before adding the asphalt binder shall be not less than 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.

In Section 29-1.04B replace the 2nd paragraph with:

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

In Section 29-1.05 replace the 1st paragraph with:

Asphalt treated permeable base shall be spread and compacted as specified for hot mix asphalt under the "Method" construction process in Section 39, "Hot Mix Asphalt," and these specifications.

In Section 29-1.07 replace the 2nd paragraph with:

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
(Issued 08-17-07)

In Section 37-1.03 replace the 4th, 5th, and 6th paragraphs with:

On 2-lane two-way roadways, W8-7 "LOOSE GRAVEL" signs and W13-1 (35) speed advisory signs shall be furnished and placed adjacent to both sides of the traveled way where screenings are being spread on a traffic lane. The first W8-7 sign in each direction shall be placed where traffic first encounters loose screenings, regardless of which lane the screenings are being spread on. The W13-1 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 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.

In Section 37-1.07 replace the 2nd paragraph with:

Rollers shall be oscillating type pneumatic-tired rollers. A minimum of 2 pneumatic-tired rollers conforming to the provisions in Section 39-3.03 "Spreading and Compacting Equipment," shall be furnished.

In Section 37-1.09 replace the 2nd paragraph with:

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying seal coat, complete in place, including furnishing, placing, maintaining, and removing W8-7 and W13-1 signs, when required, and temporary supports or barricades for the signs, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

SECTION 39 ASPHALT CONCRETE
(Issued 06-05-09)

Replace Section 39 with:
SECTION 39 HOT MIX ASPHALT

39-1 GENERAL

39-1.01 DESCRIPTION

Section 39 includes specifications for producing and placing hot mix asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture.

The special provisions specify one or more type of HMA, including:

1. Type A
2. Type B
3. Open graded friction course (OGFC). OGFC includes hot mix asphalt (open graded), rubberized hot mix asphalt (open graded) (RHMA-O) and rubberized hot mix asphalt (open graded high binder) (RHMA-O-HB)
4. Rubberized hot mix asphalt (gap graded) (RHMA-G)

The special provisions specify the HMA construction process, including:

1. Standard
2. Method
3. Quality Control / Quality Assurance (QC / QA)

39-1.02 MATERIALS

39-1.02A Geosynthetic Pavement Interlayer

Geosynthetic pavement interlayer must comply with the specifications 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.

Notify the Engineer if you dilute asphaltic emulsion with water. The mass ratio of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water either by mass or volume in compliance with the specifications for weighing, measuring, and metering devices under Section 9-1.01, "Measurement of Quantities," or you may use water meters from water districts, cities, or counties. If you measure water by volume, apply a conversion factor to determine the correct mass.

With each dilution, submit in writing:

1. The mass ratio of water to bituminous material in the original asphaltic emulsion
2. The mass of asphaltic emulsion before diluting
3. The mass of added water
4. The final dilution mass ratio of water to asphaltic emulsion

39-1.02C Asphalt Binder

Asphalt binder in HMA must comply with Section 92, "Asphalts," or Section 39-1.02D, "Asphalt Rubber Binder." The special provisions specify the grade.

Asphalt binder for geosynthetic pavement interlayer must comply with Section 92, "Asphalts." Choose from Grades PG 64-10, PG 64-16, or PG 70-10.

39-1.02D Asphalt Rubber Binder

General

Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier (CRM)

The combined asphalt binder and asphalt modifier must be 80.0 ± 2.0 percent by 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 ± 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 that complies with the asphalt rubber binder specifiecations. In the design, designate the asphalt, asphalt modifier, and CRM and their proportions. 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 °C for a period of 16 hours. After the 16-hour (1320 minutes) cool-down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1440 minutes).
[b] "X" denotes required testing

Asphalt Rubber Binder

After interacting for a minimum of 45 minutes, asphalt rubber binder must comply with:

Asphalt Rubber Binder

Quality Characteristic	Test for Quality Control or Acceptance	Test Method	Specification	
			Minimum	Maximum
Cone penetration @ 77 °F, 0.10 mm	Acceptance	ASTM D 217	25	70
Resilience @ 77 °F, percent rebound	Acceptance	ASTM D 5329	18	--
Field softening point, °F	Acceptance	ASTM D 36	125	165
Viscosity @ 177 °C, 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-millimeter sieve is coarse
2. Passing the 4.75-millimeter sieve is fine
3. Added and passing the 0.6-millimeter 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 and lime treatment, aggregate must comply with:

Aggregate Quality

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 Rev.		12	--	12	12
Loss at 500 Rev.		45	50	40	40
Sand equivalent (min.) [a]	CT 217	47	42	47	--
Fine aggregate angularity (% min.) [b]	AASHTO T 304 Method A	45	45	45	--
Flat and elongated particles (% max. by mass @ 5:1)	ASTM D 4791	10	10	10	10

Notes:
[a] Reported value must be the average of 3 tests from a single sample.
[b] The Engineer waives this specification if HMA contains less than 10 percent of nonmanufactured sand by mass of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

39-1.02F Reclaimed Asphalt Pavement

You may produce HMA using reclaimed asphalt pavement (RAP). HMA produced using RAP must comply with the specifications for HMA except aggregate quality specifications do not apply to RAP. You may substitute RAP aggregate for a part of the virgin aggregate in HMA in a quantity not exceeding 15.0 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the job mix formula (JMF) submittal. The JMF must include the percent of RAP used. If you change your assigned RAP aggregate substitution rate by more than 5 percent (within the 15.0 percent limit), submit a new JMF.

Process RAP from asphalt concrete. You may process and stockpile RAP throughout the project's life. Prevent material contamination and segregation. Store RAP in stockpiles on smooth surfaces free of debris and organic material. Processed RAP stockpiles must consist only of homogeneous RAP.

39-1.03 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS

39-1.03A General

A mix design consists of performing California Test 367 and laboratory procedures on combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. If RAP is used, use Laboratory Procedure LP-9. The result of the mix design becomes the proposed JMF.

Use Form CEM-3512 to document aggregate quality and mix design data. Use Form CEM-3511 to present the JMF.

Laboratories testing aggregate qualities and preparing the mix design and JMF must be qualified under the Department's Independent Assurance Program. Take samples under California Test 125.

The Engineer reviews the aggregate qualities, mix design, and JMF and verifies and accepts the JMF.

You may change the JMF during production. Do not use the changed JMF until the Engineer accepts it. Except when adjusting the JMF in compliance with Section 39-1.03E, "Job Mix Formula Verification," perform a new mix design and submit in writing a new JMF submittal for changing any of the following:

1. Target asphalt binder percentage
2. Asphalt binder supplier
3. Asphalt rubber binder supplier
4. Component materials used in asphalt rubber binder or percentage of any component materials
5. Combined aggregate gradation
6. Aggregate sources
7. Substitution rate for RAP aggregate of more than 5 percent

8. Any material in the JMF

For OGFC, submit in writing a complete JMF submittal except asphalt binder content. The Engineer determines the asphalt binder content under California Test 368 within 20 days of your complete JMF submittal and provides you a Form CEM-3513.

39-1.03B Hot Mix Asphalt Mix Design

Perform a mix design that produces HMA in compliance with:

Hot Mix Asphalt Mix Design Requirements

Quality Characteristic	Test Method	HMA Type		
		A	B	RHMA-G
Air voids content (%)	CT 367[a]	4.0	4.0	Special Provisions
Voids in mineral aggregate (% min.)	LP-2			
4.75-mm grading		17.0	17.0	--
9.5-mm grading		15.0	15.0	--
12.5-mm grading		14.0	14.0	18.0 – 23.0[b]
19-mm grading		13.0	13.0	18.0 – 23.0[b]
Voids filled with asphalt (%)	LP-3			
4.75-mm grading		76.0 – 80.0	76.0 – 80.0	Note d
9.5-mm grading		73.0 – 76.0	73.0 – 76.0	
12.5-mm grading		65.0 – 75.0	65.0 – 75.0	
19-mm grading		65.0 – 75.0	65.0 – 75.0	
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.) [c]	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 °± 3 °C by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 60 °C for a minimum of 2 hours and not more than 3 hours."

[d] Report this value in the JMF submittal.

For stability and air voids, prepare 3 briquettes at the OBC and test for compliance. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 8 points. The average air void content may vary from the specified air void content by ±0.5 percent.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use the same briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.03C Job Mix Formula Submittal

Each JMF submittal must consist of:

1. Proposed JMF on Form CEM-3511
2. Mix design documentation on Form CEM-3512 dated within 12 months of submittal
3. JMF verification on Form CEM-3513, if applicable
4. JMF renewal on Form CEM-3514, if applicable
5. Materials Safety Data Sheets (MSDS) for:

    5.1. Asphalt binder
    5.2. Base asphalt binder used in asphalt rubber binder
    5.3. CRM and asphalt modifier used in asphalt rubber binder

5.4. Blended asphalt rubber binder mixture
5.5. Supplemental fine aggregate except fines from dust collectors
5.6. Antistrip additives

If the Engineer requests in writing, sample the following materials in the presence of the Engineer and place in labeled containers weighing no more than 22.5 kg each:

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. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.
4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

39-1.03D Job Mix Formula Review

The Engineer reviews each mix design and proposed JMF within 5 business days from the complete JMF submittal. The review consists of reviewing the mix design procedures and comparing the proposed JMF with the specifications.

The Engineer may verify aggregate qualities during this review period.

39-1.03E Job Mix Formula Verification

If you cannot submit a Department-verified JMF on Form CEM-3513 dated within 12 months before HMA production, the Engineer verifies the JMF.

Based on your testing and production experience, you may submit on Form CEM-3511 an adjusted JMF before the Engineer's verification testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ±0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

For HMA Type A, Type B, and RHMA-G, the Engineer verifies the JMF from samples taken from HMA produced by the plant to be used. Notify the Engineer in writing at least 2 business days before sampling materials.

In the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Sample RAP from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample from any of the following locations:

1. The plant
2. A truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

You may sample from a different project including a non-Department project if you make arrangements for the Engineer to be present during sampling.

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and use 1 part for your testing.

The Engineer verifies each proposed JMF within 20 days of receiving verification samples. If you request in writing, the Engineer verifies RHMA-G quality requirements within 3 business days of sampling. Verification is testing for compliance with the specifications for:

1. Aggregate quality
2. Aggregate gradation (JMF TV ± tolerance)
3. Asphalt binder content (JMF TV ± tolerance)
4. HMA quality specified in the table Hot Mix Asphalt Mix Design Requirements except:

    4.1. Air voids content (design value ± 2.0 percent)
    4.2. Voids filled with asphalt (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)
    4.3. Dust proportion (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)

The Engineer prepares 3 briquettes from a single split sample. To verify the JMF for stability and air voids content, the Engineer tests the 3 briquettes and reports the average of 3 tests. The Engineer prepares new briquettes if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

If the Engineer verifies the JMF, the Engineer provides you a Form CEM-3513.

If the Engineer's tests on plant-produced samples do not verify the JMF, the Engineer notifies you in writing and you must submit a new JMF submittal or submit an adjusted JMF based on your testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ±0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

You may adjust the JMF only once due to a failed verification test. An adjusted JMF requires a new Form CEM-3511 and verification of a plant-produced sample.

The Engineer reverifies the JMF if HMA production has stopped for longer than 30 days and the verified JMF is older than 12 months.

For each HMA type and aggregate size specified, the Engineer verifies at the State's expense up to 2 proposed JMF including a JMF adjusted after verification failure. The Engineer deducts $3,000 from payments for each verification exceeding this limit. This deduction does not apply to verifications initiated by the Engineer or if a JMF expires while HMA production is stopped longer than 30 days.

39-1.03F Job Mix Formula Renewal

You may request a JMF renewal by submitting the following:

1. Proposed JMF on Form CEM-3511
2. A previously verified JMF documented on Form CEM-3513 dated within 12 months
3. Mix design documentation on Form CEM-3512 used for the previously verified JMF

If the Engineer request in writing, sample the following materials obtained in the presence of the Engineer and place in labeled containers weighing no more than 22.5 kg each:

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. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.

4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer reviews each complete JMF renewal submittal within 5 business days.

The Engineer may verify aggregate qualities during this review period.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate, RAP, and HMA, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer verifies the JMF renewal submittal under Section 39-1.03E, "Job Mix Formula Verification," except:

1. The Engineer retains samples until you provide test results for your part on Form CEM-3514.
2. The Engineer tests samples of materials obtained from the HMA production unit after you submit test results that comply with the specifications for the quality characteristics under Section 39-1.03E, "Job Mix Formula Verification."
3. The Engineer verifies each proposed JMF within 30 days of receiving verification samples.
4. You may not adjust the JMF due to a failed verification.
5. For each HMA type and aggregate gradation specified, the Engineer verifies at the State's expense 1 proposed JMF.

If the Engineer verifies the JMF renewal, the Engineer provides you a Form CEM-3513.

39-1.03G Job Mix Formula Acceptance

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

39-1.04 CONTRACTOR QUALITY CONTROL

39-1.04A General

Establish, maintain, and change a quality control system to ensure materials and work comply with the specifications. Submit quality control test results to the Engineer within 3 days of a request except when QC / QA is specified.

You must identify the HMA sampling location in your Quality Control Plan. During production, take samples under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

39-1.04B Prepaving Conference

Meet with the Engineer at a prepaving conference at a mutually agreed time and place. Discuss methods of performing the production and paving work.

39-1.04C Asphalt Rubber Binder

Take asphalt rubber binder samples from the feed line connecting the asphalt rubber binder tank to the HMA plant. Sample and test asphalt rubber binder under Laboratory Procedure LP-11.

Test asphalt rubber binder for compliance with the viscosity specifications in Section 39-1.02, "Materials." During asphalt rubber binder production and HMA production using asphalt rubber binder, measure viscosity every hour with not less than 1 reading for each asphalt rubber binder batch. Log measurements with corresponding time and asphalt rubber binder temperature. Submit the log daily in writing.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance." With the Certificate of Compliance, submit test results in writing for CRM and asphalt modifier with each truckload delivered to the HMA

plant. A Certificate of Compliance for asphalt modifier must not represent more than 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 Density Cores

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter cores at least once every 5 business days. Take 1 core for every 250 tonnes of HMA from random locations the Engineer designates. Take cores in the Engineer's presence and backfill and compact holes with material authorized by the Engineer. 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.

39-1.04G Briquettes

Prepare 3 briquettes for each stability and air voids determination. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 12 points.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use these briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.05 ENGINEER'S ACCEPTANCE

The Engineer's acceptance of HMA is specified in the sections for each HMA construction process.

The Engineer samples materials for testing under California Test 125 and the applicable test method except samples may be taken from:

1. The plant from:

    1.1. A truck
    1.2. An automatic sampling device

2. The mat behind the paver

Sampling must be independent of Contractor quality control, statistically-based, and random.

If you request, the Engineer splits samples and provides you with a part.

The Engineer accepts HMA based on:

1. Accepted JMF
2. Accepted QCP for Standard and QC / QA
3. Compliance with the HMA Acceptance tables
4. Acceptance of a lot for QC / QA
5. Visual inspection

The Engineer prepares 3 briquettes for each stability and air voids determination. The Engineer reports the average of 3 tests. The Engineer prepares new briquettes and test if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

39-1.06 DISPUTE RESOLUTION

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer in writing within 5 days of receiving a test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit written quality control test results and copies of paperwork including worksheets used to determine the disputed test results to the Engineer. An Independent Third Party (ITP) performs referee testing. Before the ITP participates in a dispute resolution, the ITP must be accredited under the Department's Independent Assurance Program. The ITP must be independent of the project. By mutual agreement, the ITP is chosen from:

1. A Department laboratory
2. A Department laboratory in a district or region not in the district or region the project is located
3. The Transportation Laboratory
4. A laboratory not currently employed by you or your HMA producer

If split quality control or acceptance samples are not available, the ITP uses any available material representing the disputed HMA for evaluation.

39-1.07 PRODUCTION START-UP EVALUATION

The Engineer evaluates HMA production and placement at production start-up.

Within the first 750 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. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and keep 1 part.

For Standard and QC / QA projects, you and the Engineer must test the split samples and report test results in writing within 3 business days of sampling. If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results.

For Standard and QC / QA projects, take 100-millimeter or 150-millimeter diameter first 750 tonnes on the first day of HMA production. For each density core, the Engineer reports the bulk specific gravity determined under California Test 308, Method A in addition to the percent of maximum theoretical density. You may test for in-place density at the density core locations and include them in your production tests for percent of maximum theoretical density.

39-1.08 PRODUCTION

39-1.08A General

Produce HMA in a batch mixing plant or a continuous mixing plant. Proportion aggregate by hot or cold feed control.

HMA plants must be Department-qualified. Before production, the HMA plant must have a current qualification under the Department's Materials Plant Quality Program.

During production, you may adjust:

1. Hot or cold feed proportion controls for virgin aggregate and RAP
2. The set point for asphalt binder content

39-1.08B Mixing

Mix HMA ingredients into a homogeneous mixture of coated aggregates.

Asphalt binder must be between 135 °C and 190 °C when mixed with aggregate.

Asphalt rubber binder must be between 177 °C and 218 °C when mixed with aggregate.

When mixed with asphalt binder, aggregate must not be more than 163 °C except aggregate for OGFC with unmodified asphalt binder must be not more than 135 °C. Aggregate temperature specifications do not apply when you use RAP.

HMA with or without RAP must not be more than 163 °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 premix the asphalt binder and asphalt modifier before adding CRM. If you premix asphalt binder and asphalt modifier, mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be between 177 °C and 218 °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 °C and the lower of 218 °C or 6 °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 °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
3. To vertical surfaces of:

    3.1. Curbs
    3.2. Gutters
    3.3. Construction joints

Before placing HMA, apply tack coat in 1 application at the minimum residual rate specified for the condition of the underlying surface:

Tack Coat Application Rates for HMA Type A, Type B, and RHMA-G

HMA over:	Minimum Residual Rates (liters per square meter)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA (between layers)	0.09	0.14	0.09
Existing AC and PCC pavement	0.14	0.18	0.14
Planed pavement	0.23	0.27	0.18

Tack Coat Application Rates for OGFC

OGFC over:	Minimum Residual Rates (liters per square meter)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA	0.14	0.18	0.14
Existing AC and PCC pavement	0.23	0.27	0.18
Planed pavement	0.27	0.32	0.23

If you dilute asphaltic emulsion, mix until homogeneous before application.

Apply to vertical surfaces with a residual tack coat rate that will thoroughly coat the vertical face without running off.

If you request in writing and the Engineer authorizes, you may:

1. Change tack coat rates
2. Omit tack coat between layers of new HMA during the same work shift if:

    2.1. No dust, dirt, or extraneous material is present
    2.2. The surface is at least 60 °C

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 °C and 175 °C when applied.

39-1.09D Geosynthetic Pavement Interlayer

Place geosynthetic pavement interlayer in compliance with the manufacturer's recommendations.

Before placing the geosynthetic pavement interlayer and asphalt binder:

1. Repair cracks 6.5 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 L ± 0.14 L 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 °C

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. Driveways
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Turn pockets

If the number of lanes change, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, you may pave an adjoining area's top layer including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.

If HMA (leveling) is specified, fill and level irregularities and ruts with HMA before spreading HMA over base, existing surfaces, or bridge decks. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not HMA (leveling).

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. If placing HMA against the edge of a longitudinal or transverse construction joint and the joint is damaged or not placed to a neat line, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. Repair or remove and replace damaged pavement at your expense.

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving. Complete finish rolling activities before the pavement surface temperature is:

1. Below 65 °C for HMA with unmodified binder
2. Below 60 °C for HMA with modified binder
3. Below 93 °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.

For Standard and QC/QA, if a 19-millimeter aggregate grading is specified, you may use a 12.5-millimeter aggregate grading if the specified paved thickness is from between 38 mm and 60 mm thick.

Spread and compact HMA under Section 39-3.03, "Spreading and Compacting Equipment," and Section 39-3.04, "Transporting, Spreading, and Compacting," for any of the following:

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

    3.1. Asphalt concrete surfacing replacement areas
    3.2. Leveling courses
    3.3. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

Do not allow traffic on new HMA pavement until its mid-depth temperature is below 71 °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-meter 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 (PI_0) and must-grinds on the top layer of HMA Type A, Type B, and RHMA-G pavement. Take 2 profiles within each traffic lane, 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 PI_0 must be at most 75 mm per 160-meter section.

On horizontal curves with a centerline radius of curvature between 300 m and 600 m including pavement within the superelevation transitions, the PI_0 must be at most 150 mm per 160-meter section.

Before the Engineer accepts HMA pavement for smoothness, submit written final profilograms.

Submit 1 electronic copy of profile information in Microsoft Excel and 1 electronic copy of longitudinal pavement profiles in ".erd" format or other ProVAL compatible format to the Engineer and to:

Smoothness@dot.ca.gov

The following HMA pavement areas do not require a PI_0. You must measure these areas with a 3.6-meter straightedge and determine must-grinds with a profilograph:

1. New HMA with a total thickness less than or equal to 75 mm
2. HMA sections of city or county streets and roads, turn lanes and collector lanes that are less than 460 m in length

The following HMA pavement areas do not require a PI_0. You must measure these areas with a 3.6-meter straightedge:

1. Horizontal curves with a centerline radius of curvature less than 300 m including pavement within the superelevation transitions of those curves
2. Within 3.66 m of a transverse joint separating the pavement from:

    2.1. Existing pavement not constructed under the same project
    2.2. A bridge deck or approach slab

3. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
4. If steep grades and superelevation rates greater than 6 percent are present on:

    4.1. Ramps
    4.2. Connectors

5. Turn lanes
6. Areas within 5 m of manholes or drainage transitions
7. Acceleration and deceleration lanes for at-grade intersections

8. Shoulders and miscellaneous areas
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 comply with the smoothness specifications, grind the pavement to within tolerances, remove and replace it, or place a layer of HMA. The Engineer must authorize your choice of correction before the work begins.

Remove and replace the areas of OGFC not in compliance with the must-grind and straightedge specifications, except you may grind OGFC for correcting smoothness:

1. At a transverse joint separating the pavement from pavement not constructed under the same project
2. Within 3.66 m of a transverse joint separating the pavement from a bridge deck or approach slab

Corrected HMA pavement areas must be uniform rectangles with edges:

1. Parallel to the nearest HMA pavement edge or lane line
2. Perpendicular to the pavement centerline

Measure the corrected HMA pavement surface with a profilograph and a 3.66-meter straightedge and correct the pavement to within specified tolerances. If a must-grind area or straightedged pavement cannot be corrected to within specified tolerances, remove and replace the pavement.

On ground areas not overlaid with OGFC, apply fog seal coat under Section 37-1, "Seal Coats."

39-1.13 MISCELLANEOUS AREAS AND DIKES

Miscellaneous areas are outside the traveled way and include:

1. Median areas not including inside shoulders
2. Island areas
3. Sidewalks
4. Gutters
5. Gutter flares
6. Ditches
7. Overside drains
8. Aprons at the ends of drainage structures

Spread miscellaneous areas in 1 layer and compact to the specified lines and grades.

For miscellaneous areas and dikes:

1. Do not submit a JMF.
2. Choose the 9.5-millimeter or 12.5-millimeter HMA Type A and Type B aggregate gradations.
3. Minimum asphalt binder content must be 6.8 percent for 9.5-millimeter aggregate and 6.0 percent for 12.5-millimeter aggregate. If you request in writing and the Engineer authorizes, you may reduce the minimum asphalt binder content.
4. Choose asphalt binder Grade PG 70-10 or the same grade specified for HMA.

39-2 STANDARD

39-2.01 DESCRIPTION

If HMA is specified as Standard, construct it under Section 39-1, "General," this Section 39-2, "Standard," and Section 39-5, "Measurement and Payment."

39-2.02 CONTRACTOR QUALITY CONTROL

39-2.02A Quality Control Plan

Establish, implement, and maintain a Quality Control Plan (QCP) for HMA. The QCP must describe the organization and procedures you will use to:

1. Control the quality characteristics

2. Determine when corrective actions are needed (action limits)
3. Implement corrective actions

When you submit the proposed JMF, submit the written QCP. You and the Engineer must discuss the QCP during the prepaving conference.

The QCP must address the elements affecting HMA quality including:

1. Aggregate
2. Asphalt binder
3. Additives
4. Production
5. Paving

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

39-2.02B Quality Control Testing

Perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control – Standard

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	HMA Type			
			A	B	RHMA-G	OGFC
Aggregate gradation[a]	CT 202	1 per 750 tonnes and any remaining part	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]
Sand equivalent (min.) [c]	CT 217		47	42	47	--
Asphalt binder content (%)	CT 379 or 382		JMF ± 0.45	JMF ± 0.45	JMF ± 0.50	JMF ± 0.50
HMA moisture content (%, max.)	CT 226 or CT 370	1 per 2500 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 (min.) [c, f] 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	One per 4000 tonnes or 2 per 5 business days, which-ever is more	30 37	30 35	-- 23	-- --
Air voids content (%) [c, g]	CT 367		4 ± 2	4 ± 2	Specification ± 2	--
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants [h]	CT 226 or CT 370	2 per day during production	--	--	--	--
Percent of crushed particles coarse aggregate (%, min.) One fractured face Two fractured faces Fine aggregate (%, min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face	CT 205	As necessary and designat-ed in the QCP. At least once per project	90 75 70	25 -- 20	-- 90 70	90 75 90
Los Angeles Rattler (%, max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	12 40

Flat and elongated particles (%, max. by mass @ 5:1)	ASTM D 4791		Report only	Report only	Report only	Report only
Fine aggregate angularity (%, min.)	AASHTO T 304, Method A		45	45	45	--
Voids filled with asphalt (%) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-3		 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	--
Voids in mineral aggregate (% min.) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-2		 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	 -- -- 18.0 – 23.0 [j] 18.0 – 23.0 [j]	--
Dust proportion [i] 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	LP-4		 0.9 – 2.0 0.6 – 1.3	 0.9 – 2.0 0.6 – 1.3	Report only	--
Smoothness	Section 39-1.12	--	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 °C, centipoises	Section 39-1.02D	Section 39-1.04C	--	--	1500 – 4000	1500 – 4000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D

Notes:
[a] Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.
[b] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."
[c] Report the average of 3 tests from a single split sample.
[d] Required for HMA Type A, Type B, and RHMA-G if the specified 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] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."
[g] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[h] For adjusting the plant controller at the HMA plant.
[i] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[j] Voids in mineral aggregate for RHMA-G must be within this range.

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Notify the Engineer in writing.
3. Take corrective action.

4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-2.03 ENGINEER'S ACCEPTANCE

39-2.03A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Standard

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	CT 202	JMF ± Tolerance [c]	JMF ± Tolerance [c]	JMF ± Tolerance [c]	JMF ± Tolerance [c]
Sieve / 19-mm / 12.5-mm / 9.5-mm					
12.5-mm / X [b] / /					
9.5-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
HMA moisture content (%, max.)	CT 226 or 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 (min.) [d, g]	CT 366				
4.75-mm and 9.5-mm gradings		30	30	--	--
12.5-mm and 19-mm gradings		37	35	23	--
Air voids content (%) [d, h]	CT 367	4 ± 2	4 ± 2	Specification ± 2	--
Percent of crushed particles	CT 205				
Coarse aggregate (%, min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (%, min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.)					
One fractured face		70	20	70	90
Percent of crushed particles	CT 205				
Coarse aggregate (%, min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Los Angeles Rattler (%, max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Fine aggregate angularity (%, min.)	AASHTO T 304, Method A	45	45	45	--
Flat and elongated particles (%, max. by mass @ 5:1)	ASTM D 4791	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [i]	LP-3				
4.75-mm grading		76.0 – 80.0	76.0 – 80.0	Report only	--
9.5-mm grading		73.0 – 76.0	73.0 – 76.0		
12.5-mm grading		65.0 – 75.0	65.0 – 75.0		
19-mm grading		65.0 – 75.0	65.0 – 75.0		
Voids in mineral aggregate (% min.) [i]	LP-2				
4.75-mm grading		17.0	17.0	--	--
9.5-mm grading		15.0	15.0	--	
12.5-mm grading		14.0	14.0	18.0 – 23.0 [j]	
19-mm grading		13.0	13.0	18.0 – 23.0 [j]	
Dust proportion [i]	LP-4				--
4.75-mm and 9.5-mm gradings		0.9 – 2.0	0.9 – 2.0	Report only	

12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3		
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 39-1.02D	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] "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 specified 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 density 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] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."
[h] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[j] Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 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 density core you take from each 250 tonnes of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

For percent of maximum theoretical density, the Engineer determines a deduction for each test result outside the specifications in compliance with:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor	HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and Replace	> 99.0	Remove and Replace

39-2.04 TRANSPORTING, SPREADING, AND COMPACTING

Determine the number of rollers needed to obtain the specified density and surface finish.

39-3 METHOD

39-3.01 DESCRIPTION

If HMA is specified as Method, construct it under Section 39-1, "General," this Section 39-3, "Method," and Section 39-5, "Measurement and Payment."

39-3.02 ENGINEER'S ACCEPTANCE

39-3.02A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Method

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	CT 202	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]
Sand equivalent (min.) [c]	CT 217	47	42	47	--
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.5	JMF ± 0.50
HMA moisture content (%, max.)	CT 226 or CT 370	1.0	1.0	1.0	1.0
Stabilometer value (min.) [c, d]	CT 366				
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.)					
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.)					
One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air voids content (%) [c, e]	CT 367	4 ± 2	4 ± 2	Specification ± 2	--
Fine aggregate angularity (% min.)	AASHTO T 304, Method A	45	45	45	--
Flat and elongated particles (% max. by mass @ 5:1)	ASTM D 4791	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [f]	LP-3			Report only	
4.75-mm grading		76.0 – 80.0	76.0 – 80.0		--
9.5-mm grading		73.0 – 76.0	73.0 – 76.0		
12.5-mm grading		65.0 – 75.0	65.0 – 75.0		
19-mm grading		65.0 – 75.0	65.0 – 75.0		
Voids in mineral aggregate (% min.) [f]	LP-2				
4.75-mm grading		17.0	17.0	--	--
9.5-mm grading		15.0	15.0	--	
12.5-mm grading		14.0	14.0	18.0 – 23.0 [g]	
19-mm grading		13.0	13.0	18.0 – 23.0 [g]	
Dust proportion [f]	LP-4				
4.75-mm and 9.5-mm gradings		0.9 – 2.0	0.9 – 2.0	Report only	--
12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3		
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 39-1.02D	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] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."
[e] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[f] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[g] Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 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 2500 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 mass 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 steel-tired, 2-axle tandem rollers. If placing over 275 tonnes of OGFC per hour, use at least 3 rollers for each paver. If placing less than 275 tonnes of OGFC per hour, use at least 2 rollers for each paver. Each roller must weigh between 2250 kilograms to 3075 kilograms per linear meter of drum width. Turn the vibrator off.

39-3.04 TRANSPORTING, SPREADING, AND COMPACTING

Pave HMA in maximum 75-millimeter thick compacted layers.

If the surface to be paved is both in sunlight and shade, pavement surface temperatures are taken in the shade.

Spread HMA Type A and Type B only if atmospheric and surface temperatures are:

Minimum Atmospheric and Surface Temperatures

Compacted Layer Thickness, mm				
	Unmodified Asphalt Binder	Modified Asphalt Binder[a]	Unmodified Asphalt Binder	Modified Asphalt Binder [a]
< 45	12.8	10	15.6	12.8
45 – 75	7.2	7.2	10	10

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

2. Modified asphalt binder, complete:

   2.1. First coverage of breakdown compaction before the surface temperature drops below 115 °C
   2.2. Breakdown and intermediate compaction before the surface temperature drops below 85 °C
   2.3. Finish compaction before the surface temperature drops below 60 °C

For RHMA-G:

1. Only spread and compact if the atmospheric temperature is at least 12.8 °C and the surface temperature is at least 15.6 °C.
2. Complete the first coverage of breakdown compaction before the surface temperature drops below 140 °C.
3. Complete breakdown and intermediate compaction before the surface temperature drops below 120 °C.
4. Complete finish compaction before the surface temperature drops below 95 °C.
5. If the atmospheric temperature is below 21 °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 °C and the surface temperature is at least 15.6 °C.
2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
3. Complete all compaction before the surface temperature drops below 95 °C.
4. If the atmospheric temperature is below 21 °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 °C and the surface temperature is at least 10 °C.
2. Complete first coverage using 2 rollers before the surface temperature drops below 115 °C.
3. Complete all compaction before the surface temperature drops below 85 °C.
4. If the atmospheric temperature is below 21 °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 °C and surface temperature is at least 15.6 °C.
2 Complete the 1st coverage using 2 rollers before the surface temperature drops below 140 °C.

3. Complete compaction before the surface temperature drops below 120 °C.
4. If the atmospheric temperature is below 21 °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.

39-4 QUALITY CONTROL / QUALITY ASSURANCE

39-4.01 DESCRIPTION

If HMA is specified as Quality Control / Quality Assurance, construct it under Section 39-1, "General," this Section 39-4, "Quality Control / Quality Assurance," and Section 39-5, "Measurement and Payment."

39-4.02 GENERAL

The QC / QA construction process consists of:

1. Establishing, maintaining, and changing if needed a quality control system providing assurance the HMA complies with the specifications
2. Sampling and testing at specified intervals, or sublots, to demonstrate compliance and to control process
3. The Engineer sampling and testing at specified intervals to verify testing process and HMA quality
4. The Engineer using test results, statistical evaluation of verified quality control tests, and inspection to accept HMA for payment

A lot is a quantity of HMA. The Engineer designates a new lot when:

1. 20 sublots are complete
2. The JMF changes
3. Production stops for more than 30 days

Each lot consists of no more than 20 sublots. A sublot is 750 tonnes except HMA paved at day's end greater than 250 tonnes is a sublot. If HMA paved at day's end is less than 250 tonnes, you may either make this quantity a sublot or include it in the previous sublot's test results for statistical evaluation.

39-4.03 CONTRACTOR QUALITY CONTROL

39-4.03A General

Use a composite quality factor, QF_C, and individual quality factors, QF_{QCi}, to control your process and evaluate your quality control program. For quality characteristics without quality factors, use your quality control plan's action limits to control process.

Control HMA quality including:

1. Materials
2. Proportioning
3. Spreading and compacting
4. Finished roadway surface

Develop, implement, and maintain a quality control program that includes:

1. Inspection
2. Sampling
3. Testing

39-4.03B Quality Control Plan

With the JMF submittal, submit a written Quality Control Plan (QCP). The QCP must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement. Discuss the QCP with the Engineer during the prepaving conference.

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

The QCP must include the name and qualifications of a Quality Control Manager. The Quality Control Manager administers the QCP and during paving must be at the job site within 3 hours of receiving notice. The Quality Control Manager must not be any of the following on the project:

1. Foreman
2. Production or paving crewmember
3. Inspector
4. Tester

The QCP must include action limits and details of corrective action you will take if a test result for any quality characteristic falls outside an action limit.

As work progresses, you must submit a written QCP supplement to change quality control procedures, personnel, tester qualification status, or laboratory accreditation status.

39-4.03C Quality Control Inspection, Sampling, And Testing

Sample, test, inspect, and manage HMA quality control.

Provide a roadway inspector while HMA paving activities are in progress. Provide a plant inspector during HMA production.

Inspectors must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement.

Provide a testing laboratory and personnel for quality control testing. Provide the Engineer unrestricted access to the quality control activities. Before providing services for the project, the Engineer reviews, accredits, and qualifies the testing laboratory and personnel under the Department's Independent Assurance Program.

The minimum random sampling and testing for quality control is:

Minimum Quality Control – QC / QA

Quality Characteristic	Test Method	Min-imum Sampl-ing and Testing Frequen-cy	HMA Type			Location of Sampling	Max. Report-ing Time Allow-ance
			A	B	RHMA-G		
Aggregate gradation [a]	CT 202	1 per 750 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 produc-tion	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent (min.) [f]	CT 217	1 per 750 tonnes	47	42	47	CT 125	24 hours
HMA moisture content (%,max.)	CT 226 or CT 370	1 per 2500 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 (min.) [f, g] 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	1 per 4000 tonnes or 2 per 5 bus-iness days, which-ever is more	30 37	30 35	-- 23		48 hours
Air voids content (%)[f, h]	CT 367		4 ± 2	4 ± 2	Specifica-tion ± 2		

Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.) One fractured face	CT 205	As necessary and designated in QCP. At least once per project.	90 75 70	25 -- 20	-- 90 70	CT 125	48 hours
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	CT 125	
Fine aggregate angularity (% min.)	AASHTO T 304, Method A		45	45	45	CT 125	
Flat and elongated particle (% max. by mass @ 5:1)	ASTM D 4791		Report only	Report only	Report only	CT 125	
Voids filled with asphalt (%) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-3		76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	LP-3	
Voids in mineral aggregate (% min.) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading	LP-2		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0 – 23.0[j] 18.0 – 23.0[j]	LP-2	
Dust proportion [i] 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	LP-4		0.9 – 2.0 0.6 – 1.3	0.9 – 2.0 0.6 – 1.3	Report only	LP-4	
Smoothness	Section 39-1.12	--	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 °C, centipoises	Section 39-1.02D	--	--	--	1500 – 4000	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 specified 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] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."
[h] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC
[j] Voids in mineral aggregate for RHMA-G must be within this range.

Within the specified reporting time, submit written test results including:

1. Sampling location, quantity, and time
2. Testing results
3. Supporting data and calculations

If test results for any quality characteristic are beyond the action limits in the QCP, take corrective actions. Document the corrective actions taken in the inspection records under Section 39-4.03E, "Records of Inspection and Testing."

Stop production, notify the Engineer in writing, take corrective action, and demonstrate compliance with the specifications before resuming production and placement on the State highway if:

1. A lot's composite quality factor, Q_{FC}, or an individual quality factor, QF_{QCi} for i = 3, 4, or 5, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor, QF_{QCi} for i = 1 or 2, is below 0.75
3. Quality characteristics for which a quality factor, QF_{QCi}, is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

39-4.03D Charts And Records

Record sampling and testing results for quality control on forms provided in the "Quality Control Manual for Hot Mix Asphalt," or on forms you submit with the QCP. The QCP must also include form posting locations and submittal times.

Submit quality control test results using the Department's statistical evaluation program, HMAPay, available at

www.dot.ca.gov/hq/construc/hma/index.htm

39-4.03E Records Of Inspection And Testing

During HMA production, submit in writing a daily:

1. HMA Construction Daily Record of Inspection. Also make this record available at the HMA plant and job site each day.
2. HMA Inspection and Testing Summary. Include in the summary:

    2.1. 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_{QC5}, for HMA paved in:

1. Areas where the specified paved thickness is less than 45 mm
2. Areas where the specified paved thickness is less than 60 mm and a 19-millimeter grading is specified and used
3. Dig outs
4. Leveling courses
5. Areas where, in the opinion of the Engineer, compaction or compaction measurement by conventional methods is impeded

Statistical Evaluation Calculations

Use the Variability-Unknown / Standard Deviation Method to determine the percentage of a lot not in compliance with the specifications. 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 ($\overline{X}$) of the test values

$$\overline{X} = \frac{\Sigma x}{n}$$

where:

x = individual test values
n = number of test values

2. Calculate the standard deviation

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

where:

$\sum(x^2)$ = sum of the squares of individual test values
$(\sum x)^2$ = sum of the individual test values squared
n = number of test values

3. Calculate the upper quality index (Qu)

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

where:

USL = target value plus the production tolerance or upper specification limit
s = standard deviation
$\overline{X}$ = arithmetic mean

4. Calculate the lower quality index (QL);

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

where:

LSL = target value minus production tolerance or lower specification limit
s = standard deviation
$\overline{X}$ = arithmetic mean

5. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L, of this Section 39-4.03F, "Statistical Evaluation", determine P_U ;

where:

P_U = the estimated percentage of work outside the USL.
$P_U = 0$, when USL is not specified.

6. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L, of this Section 39-4.03F, "Statistical Evaluation," determine P_L;

where:

P_L = the estimated percentage of work outside the LSL.
$P_L = 0$, when LSL is not specified.

7. Calculate the total estimated percentage of work outside the USL and LSL, percent defective

Percent defective = $P_U + P_L$

P_U and P_L are determined from:

P_U or P_L	**Upper Quality Index Q_U or Lower Quality Index Q_L**												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
0	1.72	1.88	1.99	2.07	2.13	2.20	2.28	2.34	2.39	2.44	2.48	2.51	2.56
1	1.64	1.75	1.82	1.88	1.91	1.96	2.01	2.04	2.07	2.09	2.12	2.14	2.16
2	1.58	1.66	1.72	1.75	1.78	1.81	1.84	1.87	1.89	1.91	1.93	1.94	1.95
3	1.52	1.59	1.63	1.66	1.68	1.71	1.73	1.75	1.76	1.78	1.79	1.80	1.81
4	1.47	1.52	1.56	1.58	1.60	1.62	1.64	1.65	1.66	1.67	1.68	1.69	1.70
5	1.42	1.47	1.49	1.51	1.52	1.54	1.55	1.56	1.57	1.58	1.59	1.59	1.60
6	1.38	1.41	1.43	1.45	1.46	1.47	1.48	1.49	1.50	1.50	1.51	1.51	1.52
7	1.33	1.36	1.38	1.39	1.40	1.41	1.41	1.42	1.43	1.43	1.44	1.44	1.44
8	1.29	1.31	1.33	1.33	1.34	1.35	1.35	1.36	1.36	1.37	1.37	1.37	1.38
9	1.25	1.27	1.28	1.28	1.29	1.29	1.30	1.30	1.30	1.31	1.31	1.31	1.31
10	1.21	1.23	1.23	1.24	1.24	1.24	1.25	1.25	1.25	1.25	1.25	1.26	1.26
11	1.18	1.18	1.19	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20
12	1.14	1.14	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
13	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.11	1.11	1.11	1.11	1.11	1.11
14	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
15	1.03	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
16	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
17	0.97	0.96	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94
18	0.93	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90
19	0.90	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
20	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.83
21	0.84	0.82	0.82	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.80	0.79
22	0.81	0.79	0.79	0.78	0.78	0.77	0.77	0.77	0.76	0.76	0.76	0.76	0.76
23	0.77	0.76	0.75	0.75	0.74	0.74	0.74	0.73	0.73	0.73	0.73	0.73	0.73
24	0.74	0.73	0.72	0.72	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70
25	0.71	0.70	0.69	0.69	0.68	0.68	0.67	0.67	0.67	0.67	0.67	0.67	0.66
26	0.68	0.67	0.67	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.63
27	0.65	0.64	0.63	0.62	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.60
28	0.62	0.61	0.60	0.59	0.59	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.57
29	0.59	0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.54
30	0.56	0.55	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52
31	0.53	0.52	0.51	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49
32	0.50	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.46	0.46	0.46	0.46	0.46
33	0.47	0.48	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43
34	0.45	0.43	0.43	0.42	0.42	0.42	0.41	0.41	0.41	0.41	0.41	0.41	0.40
35	0.42	0.40	0.40	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38
36	0.39	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
37	0.36	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32
38	0.33	0.32	0.32	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30
39	0.30	0.30	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
40	0.28	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
41	0.25	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
42	0.23	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
43	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
44	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
45	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
46	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
47	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
48	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
49	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1. If the value of Q_U or Q_L does not correspond to a value in the table, use the next lower value.
2. If Q_U or Q_L are negative values, P_U or P_L is equal to 100 minus the table value for P_U or P_L.

Quality Factor Determination

Determine individual quality factors, QF_{QCi}, using percent defective = $P_U + P_L$ and:

Quality Factors

Quality Factor	Maximum Allowable Percent Defective ($P_U + P_L$)												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
1.05				0	0	0	0	0	0	0	0	0	0
1.04			0	1	3	5	4	4	4	3	3	3	3
1.03		0	2	4	6	8	7	7	6	5	5	4	4
1.02		1	3	6	9	11	10	9	8	7	7	6	6
1.01	0	2	5	8	11	13	12	11	10	9	8	8	7
1.00	22	20	18	17	16	15	14	13	12	11	10	9	8
0.99	24	22	20	19	18	17	16	15	14	13	11	10	9
0.98	26	24	22	21	20	19	18	16	15	14	13	12	10
0.97	28	26	24	23	22	21	19	18	17	16	14	13	12
0.96	30	28	26	25	24	22	21	19	18	17	16	14	13
0.95	32	29	28	26	25	24	22	21	20	18	17	16	14
0.94	33	31	29	28	27	25	24	22	21	20	18	17	15
0.93	35	33	31	29	28	27	25	24	22	21	20	18	16
0.92	37	34	32	31	30	28	27	25	24	22	21	19	18
0.91	38	36	34	32	31	30	28	26	25	24	22	21	19
0.90	39	37	35	34	33	31	29	28	26	25	23	22	20
0.89	41	38	37	35	34	32	31	29	28	26	25	23	21
0.88	42	40	38	36	35	34	32	30	29	27	26	24	22
0.87	43	41	39	38	37	35	33	32	30	29	27	25	23
0.86	45	42	41	39	38	36	34	33	31	30	28	26	24
0.85	46	44	42	40	39	38	36	34	33	31	29	28	25
0.84	47	45	43	42	40	39	37	35	34	32	30	29	27
0.83	49	46	44	43	42	40	38	36	35	33	31	30	28
0.82	50	47	46	44	43	41	39	38	36	34	33	31	29
0.81	51	49	47	45	44	42	41	39	37	36	34	32	30
0.80	52	50	48	46	45	44	42	40	38	37	35	33	31
0.79	54	51	49	48	46	45	43	41	39	38	36	34	32
0.78	55	52	50	49	48	46	44	42	41	39	37	35	33
0.77	56	54	52	50	49	47	45	43	42	40	38	36	34
0.76	57	55	53	51	50	48	46	44	43	41	39	37	35
0.75	58	56	54	52	51	49	47	46	44	42	40	38	36
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:

1. To obtain a quality factor when the estimated percent outside specification limits from table, "Upper Quality Index Q_U or Lower Quality Index Q_L," does not correspond to a value in the table, use the next larger value.

Compute the composite of single quality factors, QF_C, for a lot using:

$$QF_C = \sum_{i=1}^{5} w_i \, QF_{QC_i}$$

where:

QF_C = the composite quality factor for the lot rounded to 2 decimal places.
QF_{QCi} = the quality factor for the individual quality characteristic.
w = the weighting factor listed in the table HMA Acceptance – QC / QA.

i = the quality characteristic index number in the table HMA Acceptance – QC / QA.

39-4.04 ENGINEER'S QUALITY ASSURANCE

39-4.04A General

The Engineer assures quality by:

1. Reviewing mix designs and proposed JMF
2. Inspecting procedures
3. Conducting oversight of quality control inspection and records
4. Verification sampling and testing during production and paving

39-4.04B Verification Sampling And Testing

General

The Engineer samples:

1. Aggregate to verify gradation
2. HMA to verify asphalt binder content

Verification

For aggregate gradation and asphalt binder content, the 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 up to 20 sequential sublots for the comparison. The Engineer uses production start-up evaluation tests to represent the first sublot. When there are less than 20 sequential sublots, the Engineer uses the maximum number of sequential sublots available. The 21st sublot becomes the 1st sublot (n = 1) in the next lot.

The t-value for a group of test data is computed as follows:

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

where:

n_c = Number of quality control tests (2 minimum, 20 maximum).
n_v = Number of verification tests (minimum of 1 required).
$\overline{X}_c$ = Mean of quality control tests.
$\overline{X}_v$ = Mean of verification tests.
S_p = Pooled standard deviation (When $n_v = 1$, $S_p = S_c$).
S_c = Standard deviation of quality control tests.
S_v = Standard deviation of verification tests (when $n_v > 1$).

The comparison of quality control test results and the verification test results is at a level of significance of $\alpha = 0.025$. The Engineer computes t and compares it to the critical t-value, t_{crit}, from:

Critical T-Value

Degrees of freedom (n_c+n_v-2)	t_{crit} (for α = 0.025)	Degrees of freedom (n_c+n_v-2)	t_{crit} (for α = 0.025)
1	24.452	18	2.445
2	6.205	19	2.433
3	4.177	20	2.423
4	3.495	21	2.414
5	3.163	22	2.405
6	2.969	23	2.398
7	2.841	24	2.391
8	2.752	25	2.385
9	2.685	26	2.379
10	2.634	27	2.373
11	2.593	28	2.368
12	2.560	29	2.364
13	2.533	30	2.360
14	2.510	40	2.329
15	2.490	60	2.299
16	2.473	120	2.270
17	2.458	∞	2.241

If the t-value computed is less than or equal to t_{crit}, quality control test results are verified.

If the t-value computed is greater than t_{crit} and both $\overline{X}_v$ and $\overline{X}_c$ comply with acceptance specifications, the quality control tests are verified. You may continue to produce and place HMA with the following allowable differences:

1. $\left|\overline{X}_v - \overline{X}_c\right| \leq 1.0$ percent for any grading
2. $\left|\overline{X}_v - \overline{X}_c\right| \leq 0.1$ percent for asphalt binder content

If the t-value computed is greater than t_{crit} and the $\left|\overline{X}_v - \overline{X}_c\right|$ for grading 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 Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance – QC / QA

Index (i)	Quality Characteristic				Weight-ing Factor (w)	Test Method	HMA Type		
							A	B	RHMA-G
		Aggregate gradation [a]							
	Sieve	19-mm	12.5-mm	9.5-mm					
1	12.5-mm	X [b]	--	--	0.05	CT 202	JMF ± Tolerance [c]		
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 (min.) [f,, g] 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 (%)[f, h]					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.) One fractured face					CT 205	 90 70 70	 25 -- 20	 -- 90 70
	HMA moisture content (%, max.)					CT 226 or CT 370	1.0	1.0	1.0
	Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.					CT 211	 12 45	 -- 50	 12 45
	Fine aggregate angularity (% min.)					AASHTO T 304, Method A	45	45	45
	Flat and elongated particle (% max. by mass @ 5:1)					ASTM D 4791	Report only	Report only	Report only
	Voids in mineral aggregate (% min.) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading					LP-2	 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	(Note j) -- -- 18.0 - 23.0 18.0 - 23.0
	Voids filled with asphalt (%) [i] 4.75-mm grading 9.5-mm grading 12.5-mm grading 19-mm grading					LP-3	 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0	 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0	Report only
	Dust proportion [i] 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings					LP-4	 0.9 - 2.0 0.6 - 1.3	 0.9 – 2.0 0.6 – 1.3	Report only

	Smoothness		Section 39-1.12	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 specified 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 density 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] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 °C ± 3 °C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 69 °C for a minimum of 2 hours and not more than 3 hours."
[h] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[j] Voids in mineral aggregate for RHMA-G must be within this range.

The Engineer determines the percent of maximum theoretical density from the average density of 3 density cores you take from every 750 tonnes of production or part thereof divided by the maximum theoretical density.

If the specified total paved thickness is at least 45 mm and any layer is less than 45 mm, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

The Engineer stops production and terminates a lot if:

1. The lot's composite quality factor, Q_{FC}, or an individual quality factor, QF_{QCi} for i = 3, 4, or 5, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor, QF_{QCi} for i = 1 or 2, is below 0.75
3. Quality characteristics for which a quality factor, QF_{QCi}, is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

For any single quality characteristic for which a quality factor, QF_{QCi}, is not determined, except smoothness, if 2 consecutive acceptance test results do not comply with specifications:

1. Stop production.
2. Take corrective action.

3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-4.05B Statistical Evaluation, Determination Of Quality Factors And Acceptance

Statistical Evaluation and Determination of Quality Factors

To determine the individual quality factor, $QF_{QCi,}$ for any quality factor i = 1 through 5 or a lot's composite quality factor, QF_C, for acceptance and payment adjustment, the Engineer uses the evaluation specifications under Section 39-4.03F, "Statistical Evaluation," and:

1. Verified quality control test results for aggregate gradation
2. Verified quality control test results for asphalt binder content
3. The Engineer's test results for percent of maximum theoretical density

Lot Acceptance Based on Quality Factors

The Engineer accepts a lot based on the quality factors determined for aggregate gradation and asphalt binder content, QF_{QCi} for i = 1 through 4, using the total number of verified quality control test result values and the total percent defective ($P_U + P_L$).

The Engineer accepts a lot based on the quality factor determined for maximum theoretical density, QF_{QC5}, using the total number of test result values from density cores and the total percent defective ($P_U + P_L$).

The Engineer calculates the quality factor for the lot, QF_C, which is a composite of weighted individual quality factors, QF_{QCi}, determined for each quality characteristic in the HMA Acceptance – QC / QA table in Section 39-4.05A, "Testing."

The Engineer accepts a lot based on quality factors if:

1. The current composite quality factor, QF_C, is 0.90 or greater
2. Each individual quality factor, QF_{QCi} for i = 3, 4, and 5, is 0.90 or greater
3. Each individual quality factor, QF_{QCi} for i = 1 and 2, is 0.75 or greater

No single quality characteristic test may represent more than the smaller of 750 tonnes or 1 day's production.

Payment Adjustment

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

$$PA = \sum_{i=1}^{n} HMACP * wi * \left[QFQCi * (HMATT - WHMATTi) + WHMATTi\right] - \left(HMACP * HMATT\right)$$

where:

PA =	Payment adjustment rounded to 2 decimal places.
HMACP =	HMA contract price.
HMATT =	HMA total tonnes represented in the lot.
$WHMATT_i$ =	Total tonnes of waived quality characteristic HMA.
QF_{QCi} =	Running quality factor for the individual quality characteristic. QF_{QCi} for i = 1 through 4 must be from verified Contractor's QC results. QF_{QC5} must be determined from the Engineer's results on density cores taken for percent of maximum theoretical density determination.
w =	Weighting factor listed in the HMA acceptance table.
i =	Quality characteristic index number in the HMA acceptance table.

If the payment adjustment is a negative value, the Engineer deducts this amount from payment. If the payment adjustment is a positive value, the Engineer adds this amount to payment.

The 21st sublot becomes the 1st sublot (n = 1) in the next lot. When the 21st sequential sublot becomes the 1st sublot, the previous 20 sequential sublots become a lot for which the Engineer determines a quality factor. The Engineer uses this quality factor to pay for the HMA in the lot. If the next lot consists of less than 8 sublots, these sublots must be added to the previous lot for quality factor determination using 21 to 27 sublots.

39-4.05C Dispute Resolution

For a lot, if you or the Engineer dispute any quality factor, QF_{QCi}, or verification test result, every sublot in that lot must be retested.

Referee tests must be performed under the specifications for acceptance testing.

Any quality factor, QF_{QCi}, must be determined using the referee tests.

For any quality factor, QF_{QCi}, for i = 1 through 5, dispute resolution:

1. If the difference between the quality factors for QF_{QCi} using the referee test result and the disputed test result is less than or equal to 0.01, the original test result is correct.
2. If the difference between the quality factor for QF_{QCi} using the referee test result and the disputed test result is more than 0.01, the quality factor determined from the referee tests supersedes the previously determined quality factor.

39-5 MEASUREMENT AND PAYMENT

39-5.01 MEASUREMENT

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

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

If recorded batch masses are printed automatically, the contract item 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 mass is certified by a licensed weighmaster and submitted to the Engineer.

The contract item for placing HMA dike is measured by the meter along the completed length. The contract item 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 meter or square meter basis, the HMA for dike and miscellaneous areas are measured by mass.

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

39-5.02 PAYMENT

The contract 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 prepaving conference is 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 is 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 is 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 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 State will pay for HMA dike at the contract price per meter for place HMA dike and by the tonne for HMA. The contract prices paid per 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 pays for HMA specified to be a miscellaneous area at the contract price per square meter for place hot mix asphalt (miscellaneous area) and per tonne for hot mix asphalt. The contract 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 is 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," does not apply to HMA placed in dikes and miscellaneous areas.

If there are no contract items for place hot mix asphalt dike and place hot mix asphalt (miscellaneous area) and the work is specified, full compensation for constructing HMA dikes and HMA (miscellaneous areas) including excavation, backfill, and preparation of the area to receive HMA dike or HMA (miscellaneous area) is included in the contract price paid per tonne for the hot mix asphalt designated in the Engineer's Estimate and no separate payment will be made therefor.

The contract price paid per square 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 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 is included in the contract price paid per tonne for the HMA being paved over the interlayer and no separate payment will be made therefor.

The contract 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.

The Engineer does not adjust payment for increases or decreases in the quantities for tack coat, regardless of the reason for the increase or decrease. Section 4-1.03B, "Increased or Decreased Quantities," does not apply to the items for tack coat.

Full compensation for performing smoothness testing, submitting written and electronic copies of tests, and performing corrective work including applying fog seal coat is included in the contract price paid per 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 is included in the contract 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
(Issued 01-05-07)

Delete Section 40-1.015.

Replace Section 40-1.05 with:

40-1.05 PROPORTIONING

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

Replace Section 40-1.105 with:

40-1.105 EXIT RAMP TERMINI

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/m^3.

In Section 40-1.08 replace the 4th paragraph with:

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.

In Section 40-1.14 replace the 1st paragraph with:

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
(Issued 01-05-07)

In Section 41-1.02 replace the 2nd and 3rd paragraphs with:

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

Fly ash shall conform to the requirements in AASHTO Designation: M 295 for either Class C or for Class F. The brand of fly ash used in the work shall conform to the provisions for approval of admixture brands in Section 90-4.03, "Admixture Approval."

In Section 41-1.02 replace the 5th paragraph with:

Chemical admixtures and calcium chloride may be used. Chemical admixtures in the grout mix shall conform to the provisions in Section 90-4, "Admixtures." Calcium chloride shall conform to ASTM Designation: D 98.

^^

SECTION 42 GROOVE AND GRIND PAVEMENT
(Issued 12-31-01)

In Section 42-2.02 in the 3rd paragraph in the 1st subparagraph, replace the last sentence with:

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
(Issued 06-06-08)

In Section 49-1.03 replace the 1st paragraph with:

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.

In Section 49-1.03 replace the 4th paragraph with:

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

In Section 49-1.03 replace the 6th and 7th paragraphs with:

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.

In Section 49-1.03 replace the 9th paragraph with:

The Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions.

In Section 49-1.03, delete the 10th paragraph

In Section 49-1.04 replace the 4th, 5th, and 6th paragraphs with:

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.

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

In Section 49-1.05 replace the 1st paragraph with:

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.

In Section 49-1.05 replace the 7th paragraph with:

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.

In Section 49-1.07 replace the 2nd paragraph with:

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.

Replace Section 49-1.08 with:

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):

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

In Section 49-2.03 replace the 1st paragraph with:

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 AWPA Use Category.

In Section 49-2.04 replace the 1st paragraph with:

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.

In Section 49-3.01 the 5th paragraph is deleted

In Section 49-3.01 replace the 6th and 7th paragraphs with:

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)."

In Section 49-4.01 replace the 1st and 2nd paragraphs with:

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."

In Section 49-4.03 replace the 4th paragraph with:

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.

In Section 49-4.04 replace the 1st and 2nd paragraphs with:

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.

In Section 49-4.05 replace the 1st paragraph with:

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.

In Section 49-4.05 replace the 3rd paragraph with:

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.

In Section 49-6.01 replace the 1st paragraph with:

The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be measured along the longest side, from the tip elevation shown on the plans to the plane of pile cut-off.

In Section 49-6.02 replace the 3rd paragraph with:

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.

In Section 49-6.02 replace the 7th paragraph with:

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.

In Section 49-6.02 replace the 9th paragraph with:

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.

In Section 49-6.02, add:

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.

When pile tips are revised by the Engineer for timber, steel, and precast prestressed concrete piles, and for cast-in-place concrete piles consisting of driven shells filled with concrete, the additional length required, including all materials, equipment, and labor for furnishing, splicing, and installing the piling, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

All remedial work required to achieve the required nominal resistance, including suspending driving operations above the required tip elevation and redriving piles at a later time, when directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

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SECTION 50 PRESTRESSING CONCRETE
(Issued 04-04-08)

In Section 50-1.02, between the 2nd and 3rd paragraphs add:

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.

In Section 50-1.02 delete the 8th paragraph.

Replace Section 50-1.05 with:

50-1.05 PRESTRESSING STEEL

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 film thickness of the coating after curing shall be 381 µm to 1143 µm.
B. 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.
C. 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.
D. 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.
E. Epoxy-coated strand shall be cut using an abrasive saw.
F. 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.

In Section 50-1.07 replace the 2nd paragraph with:

Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of the welded seam will not be required. Ducts shall have sufficient strength to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive metallic connections which do not result in angle changes at the joints. Waterproof tape shall be used at the connections. Ducts shall be bent without crimping or flattening. Transition couplings connecting the ducts to anchoring devices shall be either ferrous metal or polyolefin. Ferrous metal transition couplings need not be galvanized.

In Section 50-1.07 replace the 7th paragraph with:

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.

In Section 50-1.08 replace the 6th paragraph with:

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

$To = Txe^{(\mu\alpha + KL)}$

Where:

To = steel stress at jacking end
Tx = steel stress at any point x
e = base of Naperian 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	μ
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

In Section 50-1.08 in the 11th paragraph, replace item 2 with:

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.

In Section 50-1.08 replace the 13th and 14th paragraphs with:

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.

In Section 50-1.09 replace the 2nd and 3rd paragraphs with:

Grout shall consist of cement and water and may contain an admixture if approved by the Engineer.

Cement shall conform to the provisions in Section 90-2.01A, "Cement."

In Section 50-1.10 replace the 5th paragraph with:

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.

In Section 50-1.11 replace the 1st paragraph with:

No separate payment will be made for pretensioning precast concrete members. Payment for pretensioning precast concrete members shall be considered as included in the contract price paid for furnish precast members as provided for in Section 51, "Concrete Structures."

In Section 50-1.11 replace the 2nd paragraph with:

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.

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SECTION 51 CONCRETE STRUCTURES
(Issued 11-21-08)

In Section 51-1.05 replace the 11th paragraph with:

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.

In Section 51-1.06A replace the 1st paragraph with:

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.

In Section 51-1.06A replace the 2nd paragraph with:

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.

In Section 51-1.06A replace the 7th paragraph with:

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.

In Section 51-1.06A, add:

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.

In Section 51-1.06A(1) replace the 1st paragraph with:

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/m^2 for the combined live and dead load regardless of slab thickness.

In Section 51-1.06A(1) replace the 8th paragraph with:

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.

In Section 51-1.06B replace the 3rd paragraph with:

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."

In Section 51-1.06B, add:

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.

In Section 51-1.06C, add:

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.

In Section 51-1.09 replace the 6th paragraph with:

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.

In Section 51-1.11 replace the 6th paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 51-1.12D replace the 4th paragraph with:

Expanded polystyrene shall be a commercially available polystyrene board. Expanded polystyrene shall have a minimum flexural strength of 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.

In Section 51-1.12F, add:

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.

In Section 51-1.12F replace the 1st and 2nd paragraphs with:

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.

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

In Section 51-1.12F replace the 4th and 5th paragraphs with:

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 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

In Section 51-1.12F(3)(a) replace the 1st and 2nd paragraphs with:

The sealant must consist of a 2-component silicone sealant that will withstand up to ±50 percent movement. Silicone sealants must be tested under California Test 435 and must comply with the following:

Specification	Requirement
Modulus at 150 percent elongation	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

In Section 51-1.12F(3)(a) delete the 3rd and 8th paragraphs.

In Section 51-1.12F(3)(a) replace the 10th paragraph with:

A Certificate of Compliance accompanied by a certified test report must be furnished for each batch of silicone sealant in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

In Section 51-1.12F(3)(b) replace the 2nd paragraph with:

The preformed elastomeric joint seal must conform to the requirements in ASTM D 2628 and the following:

1. The seal must consist of a multichannel, nonporous, homogeneous material furnished in a finished extruded form.
2. The minimum depth of the seal measured at the contact surface must be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
3. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals must provide a movement rating (MR) of not less than that shown on the plans.
4. The top and bottom edges of the joint seal must maintain continuous contact with the sides of the groove over the entire range of joint movement.
5. The seal must be furnished full length for each joint with no more than 1 shop splice in any 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.

In Section 51-1.12F(3)(b) replace the 7th paragraph with:

The joint seal must be installed full length for each joint with equipment that does not twist or distort the seal, elongate the seal longitudinally, or otherwise cause damage to the seal or to the concrete forming the groove.

Replace Section 51-1.12F(3)(c), with:

(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.

In Section 51-1.12H(1) replace the 8th paragraph with:

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

In Section 51-1.12H(1) in the 9th paragraph replace the table, with:

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

In Section 51-1.12H(2) replace the 1st paragraph with:

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.

In Section 51-1.135 replace the 1st paragraph with:

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

In Section 51-1.135 replace the 3rd paragraph with:

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

In Section 51-1.14 replace the 4th paragraph with:

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.

In Section 51-1.17 in 4th paragraph, replace the 1st sentence with:

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.

In Section 51-1.17 delete the 7th paragraph

In Section 51-1.17 delete the 13th paragraph

In Section 51-1.17 delete the 14th paragraph

Add Section:

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.

In Section 51-1.18C replace the 2nd paragraph with:

When Class 2 surface finish (gun finish) is specified, ordinary surface finish shall first be completed. The concrete surfaces shall then be abrasive blasted to a rough texture and thoroughly washed down with water. While the washed surfaces are damp, but not wet, a finish coating of machine applied mortar, approximately 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.

In Section 51-1.18C replace the 5th paragraph with:

When surfaces to be finished are in pedestrian undercrossings, the sand shall be silica sand and the cementitious material shall be standard white portland cement.

In Section 51-1.23 replace the 14th paragraph with:

Full compensation for drilling holes for dowels and grouting dowels in drilled holes; furnishing and placing mortar for mortaring spaces and recesses in and between precast members; furnishing and placing grit for walkways, stair treads and landings; furnishing and placing expansion joint filler, sheet packing, board fillers, elastomeric bearing pads, sliding joints, sliding bearings and preformed fabric pads; and grinding or grooving, as required, shall be considered as included in the contract prices paid for the various items of concrete work and no additional compensation will be allowed therefor.

In Section 51-1.23 add after the 16th paragraph:

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 meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

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SECTION 52 REINFORCEMENT
(Issued 12-07-07)

In Section 52-1.02A replace the 1st paragraph with:

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.

In Section 52-1.04 replace the 3rd paragraph with:

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.

In Section 52-1.06 replace the 3rd paragraph with:

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

In Section 52-1.07 in the 3rd paragraph, delete item C

In Section 52-1.07 replace the 11th paragraph with:

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

Replace Section 52-1.08 with:

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 samples 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. Penetrameters shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrameter shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrameter 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 penetrameter per bar, or 3 penetrameters per exposure. When 3 penetrameters per exposure are used, one penetrameter shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrameter 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 penetrameter selection. No image quality indicator equivalency will be accepted. Wire penetrameters or penetrameter blocks shall not be used.
I. Penetrameters shall be sufficiently shimmed using a radiographically identical material. Penetrameter 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."

In Section 52-1.11 after the 7th paragraph, add:

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.

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SECTION 53 SHOTCRETE
(Issued 11-02-07)

In Section 53-1.01 replace the 3rd paragraph with:

The dry-mix process shall consist of delivering dry mixed aggregate and cementitious material pneumatically or mechanically to the nozzle body and adding water and mixing the materials in the nozzle body. The wet-mix process shall consist of delivering mixed aggregate, cement, and water pneumatically to the nozzle and adding any admixture at the nozzle.

In Section 53-1.02 replace the 1st, 2nd, 3rd and 4th paragraphs with:

Cementitious material, fine aggregate, and mixing water shall conform to the provisions in Section 90, "Portland Cement Concrete."

Shotcrete to be mixed and applied by the dry-mix process shall consist of one part cementitious material to not more than 4.5 parts fine aggregate, thoroughly mixed in a dry state before being charged into the machine. Measurement may be either by volume or by 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."

In Section 53-1.04 in the 3rd paragraph, replace the 3rd subparagraph with:

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

Replace Section 53-1.07 with:

53-1.07 MEASUREMENT

Quantities of shotcrete will be measured by the cubic 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.

Replace Section 53-1.08 with:

53-1.08 PAYMENT

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.

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SECTION 55 STEEL STRUCTURES
(Issued 05-02-08)

In Section 55-1.01 replace the 3rd paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 55-1.01 replace the 4th paragraph with:

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.

In Section 55-1.05 replace the 3rd paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 55-2.01 replace the 4th and 5th paragraphs with:

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.

In Section 55-2.02 in the 1st paragraph, replace the 1st sentence with:

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].

In Section 55-3.05 replace the 1st paragraph with:

Surfaces of bearing and base plates and other metal surfaces that are to come in contact with each other or with ground concrete surfaces 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.

In Section 55-3.14, after the 9th paragraph add:

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.

In Section 55-3.17 replace the 2nd paragraph with:

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.

In Section 55-3.19 replace the 3rd paragraph with:

Immediately before setting bearing assemblies or masonry plates directly on ground concrete surfaces, the Contractor shall thoroughly clean the surfaces of the concrete and the metal to be in contact and shall apply a coating of nonsag polysulfide or polyurethane caulking conforming to the requirements in ASTM Designation: C 920 to contact areas to provide full bedding.

In Section 55-3.19 replace the 5th paragraph with:

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.

In Section 55-4.02 replace the 6th paragraph with:

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
(Issued 03-16-07)

In Section 56-1.01 delete the 3rd paragraph.

Replace Section 56-1.02A with:

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.

Replace Section 56-1.02B with:

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.

Replace Section 56-1.02F with:

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.

In Section 56-1.03 replace the 5th through the 13th paragraphs with:

Clips, eyes, or removable brackets shall be affixed to all signs and all posts and shall be used to secure the sign during shipping and for lifting and moving during erection as necessary to prevent damage to the finished galvanized or painted surfaces. Brackets on tubular sign structures shall be removed after erection. Details of the devices shall be shown on the working drawings.

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.

In Section 56-1.03 after the 13th paragraph add:

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.

In Section 56-1.10 replace the 4th paragraph with:

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.

In Section 56-2.02B replace the 5th paragraph with:

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 AWPA Use Category System: UC4A, Commodity Specification A. Posts shall be incised and the minimum retention of preservative shall be as specified in AWPA Standards.

In Section 56-2.03 replace the 4th paragraph with:

Backfill material for metal posts shall consist of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 275 kilograms of cementitious material per cubic meter.

^^

SECTION 57 TIMBER STRUCTURES
(Issued 10-12-04)

In Section 57-1.02A replace the 2nd paragraph with:

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 AWPA's 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
(Issued 11-18-05)

In Section 58-1.02 replace the 1st paragraph with:

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

In Section 58-1.02 delete the 2nd paragraph

^^

SECTION 59 PAINTING
(Issued 01-19-07)

In Section 59-1.02 replace the 1st paragraph with:

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.

In Section 59-1.05 replace the 2nd paragraph with:

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.

In Section 59-2.01, between the 1st and 2nd paragraph add:

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.

In Section 59-2.03 replace the 3rd paragraph with:

Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in 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.

In Section 59-2.06 replace the 1st paragraph with:

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.

In Section 59-2.12 replace the 3rd and 4th paragraphs with:

Contact surfaces of stiffeners, railings, built up members or open seam exceeding 6 mils in width that would retain moisture, shall be caulked with polysulfide or polyurethane sealing compound conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O, or other approved material.

The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements in SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic

Gages," of the "SSPC: The Society for Protective Coatings," except that there shall be no limit to the number or location of spot measurements to verify compliance with specified thickness requirements.

In Section 59-2.13 replace the 3rd paragraph with:

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
(Issued 07-31-07)

In Section 64-1.06 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 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.

In Section 64-1.06 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

^^

SECTION 65 REINFORCED CONCRETE PIPE
(Issued 07-31-07)

In Section 65-1.02 replace the 1st paragraph with:

Cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that 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.

In Section 65-1.02A(1) in the 11th paragraph, replace item C with:

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

In Section 65-1.035 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete in conformance with the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 225 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item.

In Section 65-1.035 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

In Section 65-1.06 in the 2nd paragraph, replace the 1st subparagraph with:

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

^^

SECTION 66 CORRUGATED METAL PIPE
(Issued 07-31-07)

In Section 66-1.045 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 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.

In Section 66-1.045 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

^^

SECTION 68 SUBSURFACE DRAINS
(Issued 07-31-07)

In Section 68-3.02D replace the 1st and 2nd paragraphs with:

Concrete for splash pads shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 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."

In Section 68-3.03 replace the 13th paragraph with:

Cement treated permeable material, which is not covered with hot mix asphalt within 12 hours after compaction of the permeable material, shall be cured by either sprinkling the material with a fine spray of water every 4 hours during daylight hours or covering the material with a white polyethylene sheet, not less than 6 mils thick. The above curing requirements shall begin at 7:00 a.m. on the morning following compaction of the cement treated permeable material and continue for the next 72 hours or until the material is covered with hot mix asphalt, whichever is less. The cement treated permeable material shall not be sprayed with water during the first 12 hours after compacting, but may be covered with the polyethylene sheet during the first 12 hours or prior to the beginning of the cure period.

In Section 68-3.03 replace the 17th and 18th paragraphs with:

Hot mix asphalt for backfilling trenches in existing paved areas shall be produced from commercial quality aggregates and asphalt and mixed at a central mixing plant. The aggregate shall conform to the 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 120ºC. 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.

In Section 68-3.03 replace the 20th paragraph with:

Type A pavement markers conforming to the details shown on the plans and the provisions in Section 85, "Pavement Markers," shall be placed on paved shoulders or dikes at outlet, vent and cleanout locations as directed by the Engineer. The waiting period for placing pavement markers on new hot mix asphalt surfacing will not apply.

Replace Section 68-3.05 with:

68-3.05 PAYMENT

The contract price paid per 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
(Issued 07-31-07)

In Section 69-1.01 replace the 1st paragraph with:

This work shall consist of furnishing and installing entrance tapers, pipe downdrains, tapered inlets, flume downdrains, anchor assemblies, reducers, slip joints and hot mix asphalt overside drains to collect and carry surface drainage down the roadway slopes as shown on the plans or as directed by the Engineer and as specified in these specifications and the special provisions.

Replace Section 69-1.02D with:

69-1.02D Hot Mix Asphalt

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

Replace Section 69-1.04 with:

69-1.04 HOT MIX ASPHALT OVERSIDE DRAINS

Hot mix asphalt overside drains shall be constructed as shown on the plans or as directed by the Engineer. The hot mix asphalt shall be placed in conformance with the provisions in Section 39-1.13, "Miscellaneous Areas."

In Section 69-1.06 replace the 2nd paragraph with:

Quantities of hot mix asphalt placed for overside drains will be paid for as provided in Section 39-5, "Measurement and Payment," for hot mix asphalt placed in miscellaneous areas.

^^

SECTION 70 MISCELLANEOUS FACILITIES
(Issued 01-05-07)

In Section 70-1.02C replace the 2nd paragraph with:

Precast concrete flared end sections shall conform to the requirements for Class III Reinforced Concrete Pipe in AASHTO Designation: M 170M. Cementitious materials and aggregate shall conform to the provisions in Section 90-2, "Materials," except that 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.

In Section 70-1.02H replace the 1st paragraph with:

Precast concrete pipe risers and pipe reducers, and precast concrete pipe sections, adjustment rings and tapered sections for pipe energy dissipators, pipe inlets and pipe manholes shall conform to the requirements in AASHTO Designation: M 199M, 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.

In Section 70-1.03 replace the 2nd paragraph with:

Cutoff walls for precast concrete flared end sections shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

^^

SECTION 72 SLOPE PROTECTION
(Issued 11-18-05)

In Section 72-4.04 replace the 6th paragraph with:

Pervious backfill material, if required by the plans, shall be placed as shown. A securely tied sack containing 0.03-m^3 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
(Issued 07-31-07)

In Section 73-1.01 in the 2nd paragraph, replace item 2 with:

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.

In Section 73-1.06 replace the 15th paragraph with:

Where hot mix asphalt or portland cement concrete pavements are to be placed around or adjacent to manholes, pipe inlets or other miscellaneous structures in sidewalk, gutter depression, island paving, curb ramps or driveway areas, the structures shall not be constructed to final grade until after the pavements have been constructed for a reasonable distance on each side of the structures.

^^

SECTION 74 PUMPING PLANT EQUIPMENT

(Issued 07-01-08)

In Section 74-1.02 delete the 2nd paragraph.

^^

SECTION 75 MISCELLANEOUS METAL

(Issued 01-18-08)

In Section 75-1.02 in the 10th paragraph, replace the table with:

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.

In Section 75-1.03 replace the 2nd paragraph with:

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.

In Section 75-1.03 replace the 7th paragraph with:

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

In Section 75-1.03 replace the 13th paragraph with:

Concrete anchorage devices shall be mechanical expansion or resin capsule types installed in drilled holes or cast-in-place insert types. The anchorage devices shall be selected from the Department's Pre-Qualified Products List 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.

In Section 75-1.03 replace the 18th paragraph with:

Mechanical expansion anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.90 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.

In Section 75-1.03 in the 19th paragraph, replace the table with:

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

In Section 75-1.03, replace the 20th paragraph with:

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.

In Section 75-1.03 in the 22nd paragraph, replace the table with:

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	—

In Section 75-1.03, replace the 24th paragraph with:

Sealing compound, for caulking and adhesive sealing, shall be a polysulfide or polyurethane material conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O.

In Section 75-1.035 replace the 3rd paragraph with:

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.

In Section 75-1.035 replace the 12th paragraph with:

Concrete for filling cable drum units shall conform to the provisions in Section 90-10, "Minor Concrete," or at the option of the Contractor, may be a mix with 9.5 mm maximum size aggregate and not less than 400 kilograms of cementitious material per cubic meter.

In Section 75-1.05 replace the 2nd paragraph with:

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
(Issued 01-05-07)

In Section 80-3.01B(2) replace the 2nd paragraph with:

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 AWPA Use Category System: UC4A, Commodity Specification A or B.

In Section 80-3.01F replace the 4th paragraph with:

Portland cement concrete for metal post and brace footings and for deadmen shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

In Section 80-4.01C replace the 4th paragraph with:

Portland cement concrete for metal post and for deadmen shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter.

^^

SECTION 81 MONUMENTS
(Issued 06-30-06)

In Section 81-1.02 replace the 5th paragraph with:

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.

In Section 81-1.02 replace the 7th paragraph with:

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
(Issued 06-30-06)

In Section 82-1.02B replace the 1st paragraph with:

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."

In Section 82-1.02D replace the 3rd paragraph with:

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.

In Section 82-1.02D replace the 11th paragraph with:

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.

In Section 82-1.02F replace the 2nd paragraph with:

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.

In Section 82-1.02F replace the 4th paragraph with:

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
(Issued 08-17-07)

In Section 83-1.02 replace the 7th paragraph with:

Mortar shall conform to the provisions in Section 51-1.135, "Mortar," and shall consist of one part by volume of cementitious material and 3 parts of clean sand.

In Section 83-1.02B replace the 1st paragraph with:

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.

In Section 83-1.02B replace the 9th paragraph with:

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.

In Section 83-1.02B replace the 11th paragraph with:

After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4A, Commodity Specification A.

In Section 83-1.02B replace the 12th paragraph with:

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.

In Section 83-1.02B replace the 24th paragraph with:

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-Polymide 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."

In Section 83-1.02D replace the 2nd paragraph with:

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.

In Section 83-1.02E replace the 2nd paragraph with:

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."

In Section 83-1.02E, delete the 3rd paragraph

In Section 83-1.02E in the 7th paragraph, replace the 2nd sentence with:

Cable shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

In Section 83-1.02I replace the 5th paragraph with:

Where shown on the plans, cables used in the frame shall be 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.

In Section 83-1.02I replace the 14th paragraph with:

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.

In Section 83-1.03 replace the 2nd paragraph with:

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.

In Section 83-1.03 replace the 7th and 8th paragraphs with:

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 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.

In Section 83-1.04 replace the 3rd and 4th paragraphs with:

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 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.

In Section 83-2.02B replace the 2nd paragraph with:

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.

In Section 83-2.02B replace the 14th paragraph with:

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.

In Section 83-2.02D(2) replace the 1st paragraph with:

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.

In Section 83-2.02D(2) replace the 3rd paragraph with:

The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 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.

In Section 83-2.03 replace the 1st and 2nd paragraphs with:

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.

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.

In Section 83-2.03 replace the 5th and 6th paragraphs with:

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 quantity of end anchor assemblies will be paid for as units determined from actual count.

In Section 83-2.04 replace the 1st and 2nd paragraphs with:

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 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.

In Section 83-2.04 replace the 4th paragraph with:

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.

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SECTION 84 TRAFFIC STRIPES AND PAVEMENT MARKINGS
(Issued 07-21-06)

In Section 84-2.02 replace the 1st paragraph with:

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).

In Section 84-3.02 replace the 1st paragraph with:

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

In Section 84-3.02 replace the 4th paragraph with:

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.

In Section 84-3.05 replace the 1st paragraph with:

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.

In Section 84-3.05, delete the 3rd paragraph.

In Section 84-3.05 replace the 10th paragraph with:

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

(Issued 07-31-07)

In Section 85-1.03 replace the 2nd through 5th paragraphs with:

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.

Replace Section 85-1.04 with:

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.

In Section 85-1.04A, delete the 2nd through 4th paragraphs.

In Section 85-1.04A replace the 5th paragraph with:

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.

Replace Section 85-1.04B with:

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.

In Section 85-1.05 replace the 6th and 7th paragraphs with:

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		
	Specific Intensity		
Reflectance	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.

In Section 85-1.05 delete the 8th paragraph.

In Section 85-1.06 replace the 6th paragraph with:

Pavement markers shall not be placed on new hot mix asphalt surfacing or seal coat until the surfacing or seal coat has been opened to public traffic for a period of not less than 7 days when hot melt bituminous adhesive is used, and not less than 14 days when epoxy adhesive is used.

In Section 85-1.06 replace the 8th paragraph with:

Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

In Section 85-1.06 in the 14th paragraph, replace the 2nd sentence with:

Cleaning shall be done by blast cleaning on all surfaces regardless of age or type, except that blast cleaning of clean, new hot mix asphalt and clean, new seal coat surfaces will not be required when hot melt bituminous adhesive is used.

In Section 85-1.06 in the 14th paragraph, replace the 7th sentence with:

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.

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SECTION 86 SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
(Issued 08-15-08)

In Section 86-1.01 replace the 2nd paragraph with:

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.

In Section 86-1.02 delete the 2nd paragraph.

In Section 86-1.06 replace the 10th paragraph with:

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."

In Section 86-2.02 in the 1st paragraph, replace the 1st sentence with:

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.

In Section 86-2.03 replace the 1st paragraph with:

Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

In Section 86-2.03 replace the 3rd, 4th, and 5th paragraph with:

Except when located on structures, foundations for posts, standards, and pedestals shall be placed "in the solid" and monolithic.

After each post, standard, and pedestal is in proper position, mortar shall be placed under the base plate as shown on the plans. The exposed portions shall be finished 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.

Reinforced cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 49, "Piling," with the following exceptions:

A. Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling,"
B. Concrete for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

In Section 86-2.03 replace the 7th paragraph with:

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.

In Section 86-2.03, delete the 8th paragraph.

In Section 86-2.03 replace the 12th paragraph with:

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.

In Section 86-2.04 replace the 1st and 2nd paragraphs with:

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.

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.

In Section 86-2.04 replace the 4th paragraph with:

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.

In Section 86-2.04 replace the 7th paragraph with:

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.

In Section 86-2.05C in the 18th paragraph, replace the 4th and 5th subparagraphs with:

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.

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.

In Section 86-2.05C in the 23rd paragraph, replace the 3rd subparagraph with:

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.

In Section 86-2.05C in the 23rd paragraph, replace the 7th subparagraph with:

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.

In Section 86-2.07 replace the 5th paragraph with:

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."

In Section 86-2.08A in the 1st paragraph in the table, after the heading replace the 4th row with:

Traffic Signal Controller Cabinet	Ungrounded Circuit Conductor	Blk	None	CON-1	6
	Grounded Circuit Conductor	Wht	None	CON-2	6

In Section 86-2.08B replace the 2nd paragraph with:

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.

In Section 86-2.12 replace the 6 and 7th paragraphs with:

After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA 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.

In Section 86-2.15 replace the 1st paragraph with:

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.

In Section 86-2.16, in the 13th paragraph, replace item B with:

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.

In Section 86-4.01 replace the 1st paragraph with:

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."

In Section 86-4.01A in the 1st paragraph, replace the 1st and 3rd subparagraphs with:

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.

In Section 86-4.01B replace the 1st paragraph with:

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.

In Section 86-4.01C replace the 1st paragraph with:

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.

In Section 86-4.01D replace the 1st paragraph with:

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.

In Section 86-4.02A replace the 1st paragraph with:

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.

In Section 86-4.02A replace the 7th paragraph with:

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.

In Section 86-4.02B replace the 1st paragraph with:

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.

In Section 86-4.02C replace the 3rd paragraph with:

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.

In Section 86-4.02D(1), in the 4th paragraph, replace the 7th subparagraph with:

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.

In Section 86-4.05 replace the 2nd paragraph with:

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.

In Section 86-4.06 replace the 1st paragraph with:

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.

In Section 86-4.06(A) in the 1st paragraph, replace the 3rd subparagraph with:

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.

In Section 86-4.07 replace the 10th paragraph with:

The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m^2 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.

In Section 86-4.07C replace the 2nd paragraph with:

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.

In Section 86-4.07D(1) replace the 2nd paragraph with:

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.

In Section 86-4.07D(1) in the 4th paragraph, replace the 5th and 7th subparagraphs with:

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.

In Section 86-5.07A(5) in Section "Elastomeric Sealant" in the 1st paragraph, replace the 2nd sentence with:

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

In Section 86-5.07A(5) in Section "Asphatic Emulsion Sealant" in the 1st paragraph, replace the 1st sentence with:

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.

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 1st paragraph, replace the 3rd sentence with:

Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant" in the 2nd paragraph in the table, after the heading replace rows 1 through 3 with:

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.

In Section 86-5.07A(5) in Section "Hot-Melt Rubberized Asphalt Sealant", replace the 10th paragraph with:

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.

In Section 86-5.01D replace the 1st paragraph with:

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.

In Section 86-6.065 in Section "Mounting Assemblies", replace the 3rd paragraph with:

At least 4.9 m of clearance shall be provided between the bottom of the fixture and the roadway.

In Section 86-8.01 replace the 1st paragraph with:

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.

In Section 86-8.01, between the 1st and 2nd paragraph add:

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).

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SECTION 88 ENGINEERING FABRIC
(Issued 01-15-02)

Replace Section 88-1.02 with:

88-1.02 Pavement Reinforcing Fabric

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)

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SECTION 90 PORTLAND CEMENT CONCRETE
(Issued 03-16-07)

Replace Section 90 with:

SECTION 90 PORTLAND CEMENT CONCRETE
90-1 GENERAL

90-1.01 DESCRIPTION

Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

The Contractor shall determine the mix proportions for concrete in conformance with these specifications.

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 alkalies, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O, when determined by methods as required in AASHTO Designation: T 105;
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/cm^3 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 m^3 of concrete or one day's pour, whichever is smaller.

When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

90-2.02A COARSE AGGREGATE

Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, reclaimed aggregate, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.

Reclaimed aggregate is aggregate that has been recovered from plastic concrete by washing away the cementitious material. Reclaimed aggregate shall conform to all aggregate requirements.

Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

A. Coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested in conformance with the requirements in California Test 227; and
B. Prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.02B FINE AGGREGATE

Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.

Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory[a]
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:

A. Fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
B. Prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.03 WATER

In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 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 SO_4, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 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 SO_4, when tested in conformance with California Test 417.

In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis ($Na_2O + 0.658\ K_2O$) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 ADMIXTURE MATERIALS

Admixture materials shall 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/m^3 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-m^3 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:

A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in nonagitating hauling equipment (central-mixed concrete).
B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
C. Mixed completely in a truck mixer (transit-mixed concrete).
D. 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-m^3 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/m^3, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m^3.

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/m^2 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 m^2/L, unless otherwise specified.

At any point, the application rate shall be within ±1.2 m^2/L of the nominal rate specified, and the average application rate shall be within ±0.5 m^2/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 m^3.

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.

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SECTION 91 PAINT

(Issued 11-18-05)

Replace Section 91-3 with:

91-3 PAINTS FOR TIMBER

91-3.01 WOOD PRIMER, LATEX-BASE

Classification:

This specification covers a ready-mixed priming paint for use on unpainted wood or exterior woodwork. It shall conform with the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for exterior wood primers, and be listed on the Exterior Latex Wood Primer MPI List Number 6.

91-3.02 PAINT; LATEX-BASE FOR EXTERIOR WOOD, WHITE AND TINTS

Classification:

This specification covers a ready-mixed paint for use on wood surfaces subject to outside exposures. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products List:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

Unpainted wood shall first be primed with wood primer conforming to the provisions in Section 91-3.01, "Wood Primer, Latex-Base."

Replace Section 91-4 with:

91-4 MISCELLANEOUS PAINTS

91-4.01 THROUGH 91-4.04 (BLANK)

91-4.05 PAINT; ACRYLIC EMULSION, EXTERIOR WHITE AND LIGHT AND MEDIUM TINTS

Classification:

This specification covers an acrylic emulsion paint designed for use on exterior masonry. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products Lists:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

This paint may be tinted by using "universal" or "all purpose" concentrates.

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SECTION 92 ASPHALTS

(Issued 03-21-08)

Replace Section 92 with:

SECTION 92 ASPHALTS

92-1.01 DESCRIPTION

Asphalt is refined petroleum or a mixture of refined liquid asphalt and refined solid asphalt that are prepared from crude petroleum. Asphalt is:

1. Free from residues caused by the artificial distillation of coal, coal tar, or paraffin
2. Free from water
3. Homogeneous

92-1.02 MATERIALS

GENERAL

Furnish asphalt under the Department's "Certification Program for Suppliers of Asphalt." The Department maintains the program requirements, procedures, and a list of approved suppliers at:

http://www.dot.ca.gov/hq/esc/Translab/fpm/fpmcoc.htm

Transport, store, use, and dispose of asphalt safely.

Prevent the formation of carbonized particles caused by overheating asphalt during manufacturing or construction.

GRADES

Performance graded (PG) asphalt binder is:

Performance Graded Asphalt Binder

Property	AASHTO Test Method	Specification Grade				
		PG 58-22 [a]	PG 64-10	PG 64-16	PG 64-28	PG 70-10
Original Binder						
Flash Point, Minimum °C	T 48	230	230	230	230	230
Solubility, Minimum % [b]	T 44	99	99	99	99	99
Viscosity at 135°C, [c] 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 hot mix asphalt from a mixing plant producing material for only one project, the Engineer determines the asphalt quantity by measuring the volume in the tank at the project's start and end provided the tank is calibrated and equipped with its measuring stick and calibration card.

The Engineer determines pay quantities from volumetric measurements as follows:

1. Before converting the volume to 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."

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SECTION 93 LIQUID ASPHALTS
(Issued 11-03-06)

In Section 93-1.04 replace the 9th paragraph with:

The following Legend and Conversion Table is to be used for converting volumes of liquid asphalt products, Grades 70 to 3000, inclusive, and paving asphalt Grades PG 58-22, PG 64-10, PG 64-16, PG 64-28, and PG 70-10, and Grades PG 58-34 PM, PG 64-28 PM, and PG 76-22 PM.

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SECTION 95 EPOXY
(Issued 03-16-07)

Replace Section 95 with:

SECTION 95 EPOXY

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 2ºC. 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 25ºC ±1ºC	35
at 10ºC ±1ºC	45
Slant Shear Strength	
2 days at 25ºC ±1ºC, MPa	7
14 days at 25ºC ±1ºC, 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	30ºC 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 25ºC	30
Bond Strength to Concrete, Time (maximum) to reach not less than 1.4 MPa	
at 25ºC ±1ºC	3.5 hours
at 13ºC ±1ºC	24 hours
Slant Shear Strength	
2 days at 25ºC ±1ºC, MPa	7 min.
14 days at 25ºC ±1ºC, 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 25ºC for 24 hours, ASTM Designation: D 4065	30ºC 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 25ºC, + 5 hours at 70ºC	
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 25ºC	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 25ºC ±1ºC	434, Part 5[b]	41.4 min.
Slant Shear Strength on Wet Concrete, MPa, after 4 days of cure in air at 25ºC ±1ºC	434, Part 5[b]	21.1 min.
Tensile Strength, Mpa	434, Part 7, except test after 4 days of cure at 25ºC ±1ºC	31.0 min.
Elongation, %	434, Part 7, except test after 4 days of cure at 25ºC ±1ºC	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 25ºC ±1ºC. 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