



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO BIDDERS
AND
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN VENTURA COUNTY IN AND
NEAR MOORPARK FROM 0.1 MILE EAST OF BALCOM CANYON ROAD TO 0.1
MILE WEST OF MONTAIR DRIVE**

In District 07 On Route 118

Under

Bid book dated August 22, 2022

Standard Specifications dated 2018

Project plans approved June 7, 2022

Standard Plans dated 2018

Identified by

Contract No. 07-341604

07-Ven-118-13.3/15.6

Project ID 0717000194

SPECIAL NOTICES

- See sections 2 and 3 for contractors' registration requirements.
- The Department advises bidders that potential claim records must be submitted by the contractor using the Department's Internet potential claim system.
- See section 2 for submittal requirements for DBE quotes, DVBE quotes, and Non-Small Business Subcontractor Preference.
- See section 5-1.34 for safety survey questionnaire requirements.
- For work plan for local material from (1) a noncommercial source or (2) a source not regulated under California jurisdiction, see section 6-1.03B(1).
- See section 7-1.02K(3) for the requirements for electronic submittal of certified payroll records using LCPtracker Pro.
- The flagging and temporary traffic control requirements have been revised. See sections 7-1.03, 7-1.04, and 12.
- See section 14-11.14 for changes to the management of treated wood waste.

CONTRACT No. 07-341604

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

HIGHWAYS

R.C. Doria
REGISTERED CIVIL ENGINEER 3/11/22
DATE



ELECTRICAL (ROADWAY)

Chukwuebuka Emetarom
REGISTERED ELECTRICAL ENGINEER 3/11/22
DATE



MAINTAINING TRAFFIC

Dyari Ahmed
REGISTERED CIVIL ENGINEER 3/11/22
DATE



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

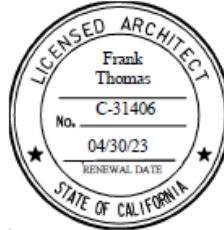
ARCHITECT

Frank Thomas

3-18-22

LICENSED ARCHITECT

DATE



STRUCTURES

Winnie Molina

3-18-22

REGISTERED CIVIL ENGINEER

DATE



MECHANICAL

Shahjahan Ali

3-18-22

REGISTERED MECHANICAL ENGINEER

DATE



ELECTRICAL

Eric Greve

3-18-22

REGISTERED ELECTRICAL ENGINEER

DATE

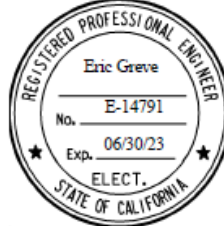


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STANDARD PLANS LIST

The standard plan sheets applicable to this Contract include those listed below. The applicable revised standard plans (RSPs) listed below are included in the project plans.

A3A	Abbreviations (Sheet 1 of 3)
A3B	Abbreviations (Sheet 2 of 3)
A3C	Abbreviations (Sheet 3 of 3)
A10A	Legend - Lines and Symbols (Sheet 1 of 5)
A10B	Legend - Lines and Symbols (Sheet 2 of 5)
A10C	Legend - Lines and Symbols (Sheet 3 of 5)
A10D	Legend - Lines and Symbols (Sheet 4 of 5)
A10E	Legend - Lines and Symbols (Sheet 5 of 5)
A20A	Pavement Markers and Traffic Lines - Typical Details
RSP A20B	Pavement Markers and Traffic Lines - Typical Details
RSP A20C	Pavement Markers and Traffic Lines - Typical Details
RSP A20D	Pavement Markers and Traffic Lines - Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows and Symbols
RSP A24E	Pavement Markings - Words
A62A	Excavation and Backfill - Miscellaneous Details
RSP A76A	Concrete Barrier Type 60M
A76B	Concrete Barrier Type 60M
RSP A77L1	Midwest Guardrail System - Standard Railing Section (Wood Post with Wood Block)
A77L3	Metal Beam Guard Railing - Reconstruct Installation
RSP A77M1	Midwest Guardrail System - Standard Hardware
RSP A77N1	Midwest Guardrail System - Wood Post and Wood Block Details
RSP A77N2	Midwest Guardrail System - Steel Post and Notched Wood Block Details
RSP A77N3	Midwest Guardrail System - Typical Line Post Embedment and Hinge Point Offset Details
RSP A77N4	Midwest Guardrail System - Typical Railing Delineation and Dike Positioning Details
RSP A77R1	Midwest Guardrail System - Typical Layouts for Fixed Objects Between Separate Roadbeds (Two-Way Traffic)
RSP A77R2	Midwest Guardrail System - Typical Layouts for Fixed Objects Between Separate Roadbeds (One-Way Traffic)
RSP A77R3	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects
RSP A77R4	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects

RSP A77R5	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects
RSP A77R6	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects
RSP A77R7	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects
RSP A77R8	Midwest Guardrail System - Typical Layouts for Roadside Fixed Objects
A81A	Crash Cushion, Sand Filled (Unidirectional)
A81B	Crash Cushion, Sand Filled (Unidirectional)
A81C	Crash Cushion, Sand Filled (Bidirectional)
P3A	Jointed Plain Concrete Pavement - Lane and Shoulder Addition or Replacement
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3A	Temporary Railing (Type K)
T3B	Temporary Railing (Type K)
T4	Temporary Traffic Screen
T9	Traffic Control System Tables for Lane and Ramp Closures
RSP T19	Traffic Control System Construction Work Zone Speed Limit Reduction on Conventional Highways
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
RS1	Roadside Signs - Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post - Typical Installation Details No. 2
RS4	Roadside Signs - Typical Installation Details No. 4
RSP ES-1A	Electrical Systems (Legend)
RSP ES-1B	Electrical Systems (Legend)
RSP ES-1C	Electrical Systems (Legend)
RSP ES-2E	Electrical Systems (Service Equipment Enclosure and Typical Wiring Diagram, Type III - B Series)
RSP ES-3C	Electrical Systems (Controller Cabinet Foundation and Pad Details)
RSP ES-3F	Electrical Systems (Telephone Demarcation Cabinet, Type C)
RSP ES-3G	Electrical Systems (Telephone Demarcation Cabinet, Type C Details)
ES-5A	Electrical Systems (Loop Detectors)
RSP ES-5B	Electrical Systems (Detectors)
RSP ES-5D	Electrical Systems (Curb and Shoulder Termination, Trench, and Handhole Details)
ES-6B	Electrical Systems (Electrolier Anchorage and Grouting for Type 15 and Type 21 Barrier Rail Mounted)
ES-6D	Electrical Systems (Lighting Standard, Types 15D and 21D, Double Luminaire Mast Arm)
RSP ES-7M	Electrical Systems (Signal and Lighting Standard, Detail No. 1)

RSP ES-7N Electrical Systems (Signal and Lighting Standard, Detail No. 2)
RSP ES-7O Electrical Systems (Signal and Lighting Standard, Detail No. 3)
RSP ES-8B Electrical Systems (Traffic Pull Box)
ES-11 Electrical Systems (Foundation Installations)
ES-13A Electrical Systems (Splice Insulation Methods Details)
RSP ES-13B Electrical Systems (Kinking and Banding Detail)
RSP ES-16B Electrical Systems (Camera Pole - 25' to 45' Pole)

CANCELED STANDARD PLANS LIST

The standard plan sheets listed below are canceled and not applicable to this contract.

Plan No.	Date Canceled	Plan No.	Date Canceled	Plan No.	Date Canceled
P31B	10-18-19				
P32A	10-18-19				
P32B	10-18-19				
C7A	10-19-18				
C7B	10-19-18				
C7C	10-19-18				
D89	10-18-19				
B11-55	04-19-19				
B11-56	10-19-18				
B11-57	10-19-18				
B11-60	04-16-21				
RSP B11-61	04-16-21				
B11-62	04-15-22				
B11-63	04-15-22				
B11-64	04-15-22				
B11-65	04-15-22				
B11-66	04-15-22				
RSP B11-67	04-15-22				
B11-68	04-15-22				
B11-69	04-15-22				
B11-70	04-15-22				
S140	04-16-21				
S141	04-16-21				
S142	04-16-21				
ES-2C	10-19-18				
RSP ES-3A	04-16-21				
RSP ES-3I	10-16-20				
ES-3J	10-16-20				
ES-3L	10-16-20				
ES-7P	04-17-20				
ES-10A	04-15-22				

NOTICE TO BIDDERS

Bids open Thursday, September 22, 2022

Dated August 22, 2022

General work description: Construct new modular office facility.

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN VENTURA COUNTY IN AND NEAR MOORPARK FROM 0.1 MILE EAST OF BALCOM CANYON ROAD TO 0.1 MILE WEST OF MONTAIR DRIVE.

District-County-Route-Post Mile: 07-Ven-118-13.3/15.6

Contract No. 07-341604

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

The DVBE Contract goal is 3 percent.

Bids must be on a unit price basis.

Complete the work within 210 working days.

The estimated cost of the project is \$2,080,000.

The Department will receive bids until 2:00 p.m. on the bid open date via Bid Express website. Bids received after this time will not be accepted. For more information refer to the Electronic Bidding Guide at the Office Engineer's website.

The Department will open and publicly read the bids through webcast/teleconference services immediately after the specified closing time.

For bid results go to:

<http://ppmoe.dot.ca.gov/des/oe/contractor-info.html>

Select *Electronic Bidding* under the *Bidding* tab.

District office addresses are provided in the *Standard Specifications*.

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

<http://ppmoe.dot.ca.gov/des/oe/bid-inquiries.php>

Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, the Department does not consider these questions 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 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.

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 website,

<http://www.dir.ca.gov>, 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 http://www.dot.ca.gov/hq/esc/oe/contractor_info. Additional information is provided in the Excluded Parties List System at <https://www.epls.gov>.

Caltrans and the Construction Industry are committed to making partnering the way we do business. For more information, go to <http://www.dot.ca.gov/hq/construc/partnering.html>.

Department of Transportation

D07NL/THM

BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070030	LEAD COMPLIANCE PLAN	LS	LUMP SUM
2	090100	TIME-RELATED OVERHEAD (WDAY)	WDAY	230
3	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
4	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
5	120165	CHANNELIZER (SURFACE MOUNTED)	EA	30
6	120204	PORTABLE RADAR SPEED FEEDBACK SIGN SYSTEM DAY	EA	840
7	129000	TEMPORARY RAILING (TYPE K)	LF	2,200
8	129100	TEMPORARY CRASH CUSHION MODULE	EA	56
9	130100	JOB SITE MANAGEMENT	LS	LUMP SUM
10	130200	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
11	130710	TEMPORARY CONSTRUCTION ENTRANCE	EA	2
12	130900	TEMPORARY CONCRETE WASHOUT	LS	LUMP SUM
13	141120	TREATED WOOD WASTE	LB	260
14	190101	ROADWAY EXCAVATION	CY	67
15	260303	CLASS 3 AGGREGATE BASE (CY)	CY	45
16	280015	LEAN CONCRETE BASE RAPID SETTING	CY	22
17	390132	HOT MIX ASPHALT (TYPE A)	TON	180
18	398000	REMOVE ASPHALT CONCRETE PAVEMENT (CY)	CY	76
19	401055	JOINTED PLAIN CONCRETE PAVEMENT (RSC)	CY	64
20	418006	REMOVE CONCRETE PAVEMENT (CY)	CY	76

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	803050	REMOVE CHAIN LINK FENCE	LF	91
22	810190	GUARD RAILING DELINEATOR	EA	32
23	820270	REMOVE ROADSIDE SIGN (WOOD POST)	EA	2
24	820790	FURNISH SINGLE SHEET ALUMINUM SIGN (0.080"-FRAMED)	SQFT	99
25	820850	ROADSIDE SIGN - TWO POST	EA	2
26	832007	MIDWEST GUARDRAIL SYSTEM (WOOD POST)	LF	500
27	839584	ALTERNATIVE IN-LINE TERMINAL SYSTEM	EA	4
28	014149	ALTERNATIVE CRASH CUSHION SYSTEM	EA	4
29	839640	CONCRETE BARRIER (TYPE 60M)	LF	520
30	839775	REMOVE CONCRETE BARRIER (TYPE K)	LF	100
31	839782	REMOVE CRASH CUSHION	EA	2
32	840517	PREFORMED THERMOPLASTIC PAVEMENT MARKING	SQFT	250
33	840621	6" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY) (BROKEN 17-7)	LF	140
34	846007	6" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY)	LF	2,280
35	846009	8" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY)	LF	1,280
36	846030	REMOVE THERMOPLASTIC TRAFFIC STRIPE	LF	4,540
37	846035	REMOVE THERMOPLASTIC PAVEMENT MARKING	SQFT	340
38	870200	LIGHTING SYSTEM	LS	LUMP SUM
39	870700	FLASHING BEACON SYSTEM	LS	LUMP SUM
40	014150	CENSUS STATION	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	014151	WEIGH STATION COMMUNICATION SYSTEM	LS	LUMP SUM
42	994650	BUILDING WORK	LS	LUMP SUM
43	999990	MOBILIZATION	LS	LUMP SUM

progress at or near the job site of this Contract:

Coincident or Adjacent Contracts

Contract no.	County–Route–Post Mile	Location	Type of work
07-350104	Ven-118-14.4/15.6	In Moorpark between 0.5 mile west of Hitch Blvd and Montair Drive	Weigh Station and Weigh-In-Motion Facility
07-351704	Ven-118-15.6/17.9R	In Moorpark from Montair Drive to Spring Road	Minor Pavement Rehabilitation
07-3W7004	Ven -118-10.0/17.9R	In and near Moorpark from Route 34 to Spring Road	Digouts, Slurry Seal, and Shoulder Backing
07-1XM304	Ven-118-9.8/14.8	PM 9.8 to 14.8	Install Steel Ramps and Wailing Siren Culverts
07-4W5004	Ven-118-5/32.4	At Various Locations	Apply Meth on Deck, Repair Joint Seals, Bearing Pads and place Polyester Concrete
07-281604	Ven-118-15.6/16.4	In Moorpark between Montair Drive and Tierra Rejada Road	Roadway Widening
07-361004	Ven-118-0.5/15.6	Between State Route 126 and Montair Drive	Pavement Preservation
07-369704	Ven-118-12/13.4	From Sand Canyon Road to 0.1 mile East of Balcom Canyon Road	Slope Repair
07-4T8604	Ven-118-12.6/13.6	At Balcom Canyon Road	Install Traffic Signal

Coordinate lane closures and traffic handling with the Engineer and with contractors of coincident or adjacent projects. Potential conflicts may not be limited to the contracts listed above.

Add to the end of section 5-1.20C:

This project does not include work on the railroad property, but a railroad is shown on the general plan sheet within the project limits. Do not trespass on the railroad property at Route 118 PM 14.1 *CROSSING AT GRADE*, Ventura County CA, Union Pacific Railroad

Replace section 5-1.34 with:

5-1.34 SAFETY SURVEY QUESTIONNAIRES

Section 5-1.34 includes specifications for safety survey questionnaires.

Within 30 days of Contract approval, submit safety survey questionnaires for your company and each subcontractor listed on the Subcontractor List form. For a joint venture, each party must complete a separate survey questionnaire. Submit safety survey questionnaires through the electronic submittal system and provide copies to the Engineer.

Each company must provide the following items in the safety survey questionnaire:

1. Business name
2. Years in business under present business name and license number
3. Workers compensation experience modification rates for the previous 5 years

If the plan requires revisions, the Engineer provides comments. Submit a revised plan within 7 days of receiving comments. Allow 7 days for the review.

6-1.03B(3) Analytical Test Results

At least 15 days before placing local material, submit analytical test results for each local material obtained from a noncommercial source or a source not regulated under CA jurisdiction. The analytical test results must include:

1. Certification signed by an engineer who is registered as a civil engineer in the State or a professional geologist licensed as a professional geologist by the State stating:

The analytical testing described in the local material plan has been performed. I performed a statistical analysis of the test results using the US EPA's ProUCL software with the applicable 95 percent upper confidence limit. I certify that the material from the local material source is suitable for unrestricted use at the job site, it has a pH above 5.0, does not contain soluble lead in concentrations equal to or greater than 5mg/l as determined by the Waste Extraction Test (WET) Procedures, 22 CA Code of Regs § 66261.24(a)(2) App II, does not contain lead in concentrations above 80 mg/kg total lead, is free from all other contaminants identified in the local material plan, and will comply with the job site's basin plan and water quality objectives of the RWQCB.

2. Chain of custody of samples
3. Analytical results no older than 1 year
4. Statistical analysis of the data using US EPA's ProUCL software with a 95 percent upper confidence limit
5. Comparison of sample results to hazardous waste concentration thresholds and the RWQCB's basin plan requirements and water quality objectives for the job site location

6-1.03B(4) Sample and Analysis

Sample and analyze local material from a (1) noncommercial source or (2) source not regulated under CA jurisdiction:

1. Before bringing the local material to the job site
2. As described in the local material plan
3. Under US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)

The sample collection must be designed to generate a data set representative of the entire volume of proposed local material.

Before excavating at the (1) noncommercial material source or (2) a source not regulated under CA jurisdiction, collect the minimum number of samples and perform the minimum number of analytical tests for the corresponding maximum volume of local material as shown in the following table:

Minimum Number of Samples and Analytical Tests for Local Material

Maximum volume of imported borrow (cu yd)	Minimum number of samples and analytical tests
< 5,000	8
5,000–10,000	12 for the first 5,000 cu yd plus 1 for each additional 1,000 cu yd or portion thereof
10,000–20,000	17 for the first 10,000 cu yd plus 1 for each additional 2,500 cu yd or portion thereof
20,000–40,000	21 for the first 20,000 cu yd plus 1 for each additional 5,000 cu yd or portion thereof
40,000–80,000	25 for the first 40,000 cu yd plus 1 for each additional 10,000 cu yd or portion thereof
> 80,000	29 for the first 80,000 cu yd plus 1 for each additional 20,000 cu yd or portion thereof

Do not collect composite samples or mix individual samples to form a composite sample.

Analyze the samples using the US EPA's ProUCL software with a 95 percent upper confidence limit. All chemical analysis must be performed by a laboratory certified by the SWRCB's Environmental Laboratory Accreditation Program (ELAP).

The analytical test results must demonstrate that the local material:

1. Is not a hazardous waste
2. Has a pH above 5.0
3. Has an average total lead concentration, based upon the 95 percent upper confidence limit, at or below 80 mg/kg
4. Is free of possible contaminants identified in the local material plan
5. Complies with the RWQCB's basin plan for the job site location
6. Complies with the RWQCB's water quality objectives for the job site location

6-1.03C Local Material Management

Do not place local material until authorized.

If the Engineer determines the appearance, odor, or texture of any delivered local material suggests possible contamination, sample and analyze the material. The sampling and analysis is change order work unless (1) hazardous waste is discovered or (2) the analytical test results indicate the material does not comply with section 6-1.03B(3).

Dispose of noncompliant local material at an appropriately permitted CA Class I, CA Class II or CA Class III facility. You are the generator of noncompliant local material.

Replace section 6-1.06 of the RSS for section 6-1 with:

6-1.06 BUY CLEAN CALIFORNIA ACT

6-1.06A Summary

For projects with a total bid over \$1 million and 175 or more original working days, the materials or products shown in the following table are subject to the Buy Clean California Act (Pub Cont Code § 3500 et seq.):

Material or product	Material specifications
Carbon steel rebar ^a	Section 52-1.02B, "Bar Reinforcement" Excludes epoxy-coated or galvanized reinforcement uses.
Structural steel ^b	Section 55-1.02D(1), "General," – Structural Steel and Other Materials tables and Section 99, "Building Construction." For hot-rolled, plate or hollow products.
Flat glass ^c	Section 99, "Building Construction"
Mineral wool board insulation ^d	Section 99, "Building Construction"

^aFor each mill providing 20,000 pounds or more on the project

^bFor each mill providing 5,000 pounds or more on the project

^cFor each manufacturer providing 2,000 square feet or more on the project

^dFor each manufacturer providing 4,000 square feet or more on the project

An informal-bid contract is not subject to Buy Clean California Act requirements.

For carbon steel rebar material subject to Buy Clean California Act, the source mill must be on the Authorized Material List for Buy Clean California Act compliant steel mills. Identify source mills on Notice of Materials to be Used form submittals.

For structural steel, flat glass, and mineral wool board insulation subject to Buy Clean California Act, submit an environmental product declaration for each applicable material or product at least 15 days before scheduled installation. The global warming potential of each applicable material or product as evidenced by its environmental product declaration shall not exceed the maximum acceptable global warming potential values established by the Department of General Services. Do not install the applicable

material or product until the submittal has been authorized. The maximum acceptable global warming potential for each category of material or product is published on the Department of General Services website at:

<https://www.dgs.ca.gov/>

For product category rules for structural steel, flat glass, or mineral wool board insulation, go to the METS website. Use the product category rule in effect on the date of bid opening unless otherwise authorized. An environmental product declaration for structural steel, flat glass, or mineral wool board is not required for either of the following conditions:

1. Applicable product category rule has expired without replacement as of the bid opening date.
2. Applicable product category rule was issued less than 100 days before the bid opening date.

Upon each jobsite shipment receipt of materials or products subject to these Buy Clean California Act requirements, report the represented quantity information using the Department's Data Interchange for Materials Engineering.

6-1.06B Definitions

environmental product declaration: Independently verified document created and verified under International Organization for Standardization (ISO) 14025 for Type III environmental declarations that identifies the global warming potential emissions of the facility-specific material or product through a product stage life cycle assessment.

product category rule: Program operator established rule based on the science of life cycle assessment that governs the development of the environmental product declaration for the material or product.

product stage: Boundary of the environmental product declaration that includes (1) raw material supply, (2) transportation processes, and (3) processing operations, including operations such as melting, mixing, milling, finishing, curing, cooling, trimming, packaging and loading for transport delivery. Commonly referred to as a "cradle-to-gate" life cycle assessment.

program operator: Independent agency that supervises and confirms the full environmental product declaration development process under ISO 14025.

raw material supply: Upstream processes which can include allocations, extraction, refinement, reclamation, handling and processing of the constituents used in producing the material or product.

transportation processes: Includes transportation of raw, reclaimed or recycled material constituents from the supplier to the gate of the manufacturer, producer or fabricator. Includes transport of related waste products.

6-1.06C Submittals

You must register on the Department's Data Interchange for Materials Engineering at least 15 days before submitting either of the following:

1. Represented quantity information for materials or products subject to Buy Clean California Act
2. Environmental product declarations for structural steel, flat glass, or mineral wool board insulation

Follow the registration process at:

<https://dime.dot.ca.gov/>

Submit environmental product declarations for structural steel, flat glass, and mineral wool board insulation to the Department's Data Interchange for Materials Engineering and provide PDF copies to the Engineer.

Submit certified mill test reports upon delivery of carbon steel rebar and structural steel materials to the project documenting their compliance. Do not incorporate these materials and products into the work until compliant documentation has been provided to the Engineer.

Offset the approach end of a temporary barrier system a minimum of 15 feet from the edge of an open traffic lane, use the offset rate in the table below:

Temporary Barrier System Offset Rate

Posted speed (mph)	Rate ^a
0 to 45	10:1
46 to 60	15:1
61 to 70	20:1

^a Rate is longitudinally to transversely with respect to the edge of the traveled way.

If the 15-foot minimum offset cannot be achieved, offset the temporary barrier the maximum distance available and install an array of temporary crash cushion modules or an authorized temporary crash cushion system at the approach end of the barrier system.

Replace section 12-3.20C(3)(c) of the RSS for section 12 with:

12-3.20C(3)(c) 12'-9" Temporary Steel Barrier

Install a minimum of 260 feet of 12'-9" temporary steel barrier.

Place temporary barrier system on asphalt concrete surface. The asphalt concrete surface must have a minimum of 6 inches of asphalt concrete over a minimum of 6 inches of compacted base. Do not place the system on concrete or earth surface.

Stake down the first and last segment of the temporary steel barrier system.

Maintain a minimum radius of 775 feet for segments placed on a curved layout.

Maintain a minimum 2-foot set back distance on both sides of a temporary barrier system used with traffic on both sides of the barrier.

Install temporary barrier system under the approved manufacturer's instructions except you may use any approved temporary crash cushion.

Add between the 9th and 10th paragraphs of section 12-3.32C of the RSS for section 12:

Start displaying the message on the sign 5 minutes before closing the lane or shoulder or when directed by the Engineer.

Add to section 12-4.02A(2) of the RSS for section 12:

special days: Martin Luther King Jr and Columbus Day

Add between the 1st and 2nd paragraphs of section 12-4.02A(3)(c) of the RSS for section 12-4:

Submit a contingency plan for the following activity:

1. Striping

Add to the end of the 1st paragraph of section 12-4.02C(1) of the RSS for section 12:

except for work shown on the traffic handling plans

Add to the end of section 12-4.02C(3)(a) of the RSS for section 12:

If work vehicles or equipment is parked on the shoulder within 6 feet of a traffic lane at Route 118, close the shoulder area with fluorescent-orange traffic cones or portable delineators. Place the cones or delineators on a taper in advance of the parked vehicles or equipment and along the edge of the traveled way at 25-foot intervals to a point not less than 25 feet past the last vehicle or piece of equipment. Use at least 9 cones or delineators for the taper. Place advance warning signs as specified in section 12-4.02C(8).

You may perform construction activities during the hours designated as *No work is allowed* on chart no. K1 if you install temporary traffic screens on top of the Type K temporary railings. The Department does not pay for furnishing, installing, maintaining, or removing temporary traffic screens that you elect to install on top of the Type K temporary railings.

Replace Reserved in section 12-4.02C(3)(e) of the RSS for section 12 with:

Do not work from 1800 on Halloween to 0600 the following day.

Replace Reserved in section 12-4.02C(3)(f) of the RSS for section 12 with:

Closure restrictions for designated holidays and special days are shown in the following table:

Conventional Highway Lane Closure Restrictions for Designated Holidays and Special Days											
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Mon
x	H xx	xx	xx								
x	xx	H xx	xx								
	x	xx	xx	H xx	xxx						
	x			SD xx							
	x	xx	xx	xx	H xx						
					x	H xx					
						x	H xx	xx	xx	xx	
	x	xx	xx	xx	xx	xx	TH xx	xx	xx	xx	
Legend:											
	Refer to chart no. K1.										
x	The full width of the traveled way must be open for use by traffic by 0600.										
xx	The full width of the traveled way must be open for use by traffic.										
H	Designated holiday										
TH	Thanksgiving Day										
SD	Special day										

Replace Reserved in section 12-4.02C(3)(k) of the RSS for section 12 with:

Comply with the requirements for the conventional highway lane closures shown in the following chart:

Chart No. K1 Conventional Highway Lane Requirements and Hours of Work																									
County: Ven										Route/Direction: 118/EB & WB															
Closure limits: At Moorpark Commercial Vehicle Enforcement Facilities																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	S	S	S	S	S	S	S	N	N	N	S	S	S	S	S	S	N	N	N	N	S	S	S	S	S
Fri	S	S	S	S	S	S	N	N	N	S	S	S	S	S	S	N	N	N	N	S	S	S	S	S	S
Sat	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sun	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Legend:																									
S Shoulder closure is allowed. (right/left)																									
N No work is allowed.																									
REMARKS: The number of through traffic lanes in each direction of travel is 1 Place a portable Changeable Message sign in advance of the construction zone in both directions of travel, inside the shoulder area, at least 7 days in advance of any lane closure and remove when lane closures are no longer required with the following 3-flash message: 1. ROADWORK/AHEAD/X AM- X PM 2. XX-XX/TO/XX-XX (Month/Date) 3. EXPECT/DELAY																									

Replace item 2 in the list in the 2nd paragraph of section 12-4.02C(4) of the RSS for section 12 with:

- Installation, maintenance, or removal of Category 1 and Category 2 traffic control devices and when using impact attenuator vehicles

Replace 3rd paragraph of section 12-4.02C(4) of the RSS for section 12 with:

For time periods at the beginning or end of work when the lane requirement charts do not allow the closure of the adjacent traffic lane, the following construction activities are allowed without a buffer lane:

- Parking, positioning, loading, unloading vehicles, or storing equipment or materials necessary for the work being performed.
- Placing, removing or maintaining paving marking or pavement markers.
- Operations not performed by workers on foot such as planing, sweeping, applying a tack coat, or operating a crane.
- Operations where workers on foot are protected, at each work location, within the same closure by an impact attenuator vehicle in the lane adjacent to live traffic.

Add to the end of section 12-4.02C(8)(a) of the RSS for section 12:

If shoulders are closed at Route 118, use the following advance warning signs:

- W21-5 (Shoulder Work)
- W21-5b (Right/Left Shoulder Closed Ahead)
- C30A(CA) (Shoulder Closed)

Replace section 12-4.02C(12) of the RSS for section 12 with:

12-4.02C(12) Construction Work Zone Speed Limit Reduction

12-4.02C(12)(a) General

Section 12-4.02C(12) includes specifications for providing, installing, maintaining, and removing traffic control devices for reducing the speed limit for the construction work zones.

Speed limit reduction is limited to 10 mph from the posted speed limit in construction work zones unless a greater speed limit reduction is specified. Construction work zone speed limit reduction can be required when construction activities are active in a closure as a temporary condition .

Temporary construction work zone speed limit reduction is required for lane closures when construction activities require workers to be present within the lane closures. Construction work zone speed limit reduction is not required for short duration closures of 1 hour or less or when the length of lane closure is 1/2 mile or less.

12-4.02C(12)(b) Materials

For temporary construction work zone speed limit reduction, signs must comply with the requirements for portable signs in section 12-3.11.

The PCMS must comply with section 12-3.32.

Radar feedback sign LED displays must have LED:

1. Character of at least 18 inches in height for freeways and expressways
2. Character of at least 14 inches in height for conventional highways
3. Character's width-to-height ratio from 0.7 to 1.0
4. Character's stroke width-to-height ratio of 0.2

Portable radar speed feedback sign must comply with section 12-3.37.

Portable radar speed feedback sign trailers must have a minimum of 9 cones placed on a taper in advance of the device and along the edge of shoulder or edge of the traveled way at 25-foot intervals to a point not less than 25 feet past the device.

Temporary radar speed feedback sign system must comply with the specifications for:

1. Temporary electrical system in section 87-20
2. Radar speed feedback sign system in section 87-14 except the LED character display must remain blank when no vehicles are detected or when the detected vehicle speed is 10 miles or less than the pre-set speed

12-4.02C(12)(c) Construction

Advise motorists of construction work zone speed limit reductions starting 14 days in advance of implementing the speed limit reduction using a PCMS displaying the alternating messages *Reduced Speed* and *Starting XX/XX/XX (Date)*.

When construction work zone speed limit reduction is in effect, the PCMS message must be *XX ZONE AHEAD* and *WILL BE ENFORCED*. Mount a 48-by-48-inch W3-5 XX "SPEED LIMIT" ahead symbol sign on the PCMS trailer.

For temporary construction work zone speed limit reduction for lane closures, install portable radar speed feedback system as shown. In addition to the portable radar speed feedback system shown, place a portable radar speed feedback system 400 feet upstream of active work areas. The portable radar speed feedback system must include a R2-1 sign with G20-5aP "WORK ZONE" plaque.

For conventional highways, place a R2-1 sign with G20-5aP "WORK ZONE" plaque approximately 500 feet downstream from major intersections within the limits of a construction work zone speed limit reduction.

Resize and segregate treated wood waste at a location where debris including sawdust and chips can be contained. Collect and manage the debris as treated wood waste.

Identify treated wood waste and accumulation areas using water-resistant labels that comply with Health & Safety Code §25230 et seq. Labels must include:

1. The words *TREATED WOOD WASTE Do not burn or scavenge*
2. The words *Caltrans District* and the district number
3. The words *Construction Contract* and the contract number
4. District office address
5. Engineer's name, address, and telephone number
6. Contractor's contact name, address, and telephone number
7. Date placed in storage

14-11.14E Transport and Disposal of Treated Wood Waste

Dispose of treated wood waste within:

1. 90 days of generation if stored on blocks
2. 180 days of generation if stored on a containment surface or pad
3. 1 year of generation if stored in a water-resistant container or within 90 days after the container is full, whichever is shorter
4. 1 year of generation if stored in a storage building as defined in Health & Safety Code §25230 et seq

Before transporting treated wood waste, obtain agreement from the receiving facility that it will accept the waste. Protect shipments of the waste from loss and exposure to precipitation. For projects generating 10,000 lbs or more of treated wood waste, request a generator's EPA Identification Number from the Engineer at least 5 business days before the 1st shipment. Each shipment must be accompanied by a shipping record such as a bill of lading or invoice that includes:

1. The words *Caltrans District* and the district number
2. The words *Construction Contract* and the contract number
3. District office address
4. Engineer's name, address, and telephone number
5. Contractor's name, contact person, and telephone number
6. Receiving facility's name and address
7. Description of the waste (e.g., treated wood waste with preservative type if known or unknown/mixture)
8. Project location
9. Estimated weight or volume of the shipment
10. Date accumulation begins
11. Date of transport
12. Name of transporter
13. Date of receipt by the treated wood waste facility
14. Weight of shipment measured by the receiving facility
15. Generator's US EPA Identification Number for projects generating 10,000 lbs or more of treated wood waste

The shipping record must be 8-1/2 by 11 inches and a 4-part carbon or carbonless form to provide copies for the Engineer, transporter, and treated wood waste facility.

Transport treated wood waste directly to the CA permitted disposal site after leaving the jobsite. Do not mix treated wood waste from the job site with waste from any other generator.

Dispose of treated wood waste at one of the following:

1. An approved California disposal site operating under a RWQCB permit that includes acceptance of treated wood waste
2. California disposal site operating under a DTSC permit that includes acceptance of treated wood waste

AA

DIVISION V SURFACINGS AND PAVEMENTS

39 ASPHALT CONCRETE

Replace *Reserved* in section 39-2.02B(3) with:

The grade of asphalt binder for Type A HMA must be PG 64-10.

For Type A HMA using RAP substitution of greater than 15 percent of the aggregate blend, the virgin binder grade must comply with the PG binder grade specified above with 6 degrees C reduction in the upper and lower temperature classification.

For Type A HMA using RAP substitution of 15 percent or less of the aggregate blend, the grade of the virgin binder must comply with the PG binder grade specified above.

AA

40 CONCRETE PAVEMENT

Replace "Reserved" in section 40-5 Standard Specifications with:

40-5 JOINTED PLAIN CONCRETE PAVEMENT WITH RAPID STRENGTH CONCRETE

40-5.01 GENERAL

40-5.01A Summary

Section 40-5 includes specifications for constructing Jointed Plain Concrete Pavement with Rapid Strength Concrete (JPCP-RSC).

JPCP-RSC must comply with the specifications for JPCP in section 40-4.

40-5.01B Definitions

early age: Any age less than 10 times the time of final setting.

opening age: Age when the minimum modulus of rupture specified for opening to traffic and equipment is attained.

time of final setting: Elapsed time required to develop concrete penetration resistance that is at least 4,000 psi under ASTM C403/C403M.

40-5.01C Submittals

40-5.01C(1) General

At least 15 days before delivery to the job site, submit manufacturer's recommendations, MSDS and instructions for storage and installation of joint filler material.

Submit QC test results within 48 hours of paving shift completion except submit modulus of rupture results within:

1. 15 minutes of opening age test completion
2. 24 hours of a 3, 7, or 10-day test completion

40-5.01C(2) Quality Control Plan

At least 20 days before placing trial slabs, submit a QC plan.

40-5.01C(3) Rapid Strength Concrete

At least 45 days before the intended use, submit a sample of cement from each proposed lot and samples of proposed admixtures in the quantities ordered by the Engineer.

During JPCP-RSC operations, submit uniformity reports for hydraulic cement at least once every 30 days to the Engineer and METS, attention Cement Laboratory. Uniformity reports must comply with ASTM C 917 except testing age and water content may be modified to suit the particular material.

40-5.01C(4) Mix Design

Section 40-1.01C(4) does not apply.

At least 10 days before constructing trial slabs, submit mix designs

40-5.01C(5) Coefficient of Thermal Expansion

Submit coefficient of thermal expansion per Section 40-1.01C(9), except submit your test data at:

<https://dime.dot.ca.gov/>

40-5.01D Quality Assurance

40-5.01D(1) General

Section 40-1.01D(1) does not apply.

Core pavement as described for thickness, bar placement, and air content.

Allow at least 25 days for the Department to schedule testing for coefficient of friction. Notify the Engineer when the pavement is scheduled to be opened to traffic

The Department tests for coefficient of friction within 7 days of receiving notification that the pavement is ready for testing.

40-5.01D(2) Preconstruction Meeting

Hold a preconstruction meeting as directed under section 36-1.01D(2). The following additional personnel among your and your subcontractor's workers must attend the preconstruction meeting:

1. Foreman
2. Concrete plant manager
3. Concrete plant operator
4. Concrete plant inspectors
5. Personnel performing saw cutting and joint sealing
6. Paving machine operators
7. Inspectors
8. Samplers
9. Testers

The purpose of the preconstruction meeting is to familiarize personnel with the project's specifications. Discuss the QC plan and processes for constructing each item of work including:

1. Production
2. Transportation
3. Trial slabs
4. Pavement structure removal
5. Placement
6. Contingency plan
7. Sampling
8. Testing
9. Acceptance

40-5.01D(3) Quality Control Plan

Section 40-1.01D(3) does not apply.

Establish, implement, and maintain a QC plan for pavement. The QC plan must describe the organization and procedures used to:

1. Control the production process
2. Determine if a change to the production process is needed
3. Implement a change

The QC plan must include:

1. Names and qualifications of the QC manager and assistant QC managers.
2. Action and suspension limits and details of corrective action to be taken if any process is out of those limits. Suspension limits must not exceed specified acceptance criteria.
3. Contingency plan for correcting problems in production, transportation, and placement.
4. Provisions for determining if JPCP-RSC placement must be suspended.
5. Outline of the procedure for the production, transportation, and placement of JPCP-RSC.
6. Outline of the procedure for sampling and testing to be performed during and after JPCP-RSC construction.
7. Production target values for material properties that impact concrete quality or strength including cleanness value and sand equivalent.
8. Forms to report concrete inspection, sampling, and testing results.
9. Location of your quality control testing laboratory and testing equipment to be used during and after paving operations.
10. List of the testing equipment to be used including the date of last calibration.
11. Names and certifications of quality control personnel including those performing sampling and testing.
12. Outline of the procedure for placing and testing trial slabs, including:
 - 12.1. Locations and times
 - 12.2. Production procedures
 - 12.3. Placement and finishing methods
 - 12.4. Sampling methods, sample curing, and sample transportation
 - 12.5. Testing and reposting test results reporting
13. Procedure for identifying transverse contraction joint locations relative to the dowel bars longitudinal center.
14. Procedure for consolidating concrete around the dowel bars.

The QC plan must address the elements affecting concrete pavement quality including:

1. Mix proportions
2. Aggregate gradation
3. Materials quality
4. Stockpile management
5. Line and grade control
6. Proportioning
7. Mixing and transportation
8. Placing and consolidation
9. Contraction and construction joints
10. Dowel bar placement, alignment, and anchorage
11. Tie bar placement and alignment
12. Modulus of rupture strength
13. Finishing and curing
14. Protecting pavement before opening to traffic
15. Surface smoothness

40-5.01D(4) Quality Control Manager

Designate a QC manager and assistant QC managers to administer the QC plan. The QC manager must be certified as an American Concrete Institute (ACI) Concrete Field Testing Technician-Grade I and Concrete Laboratory Testing Technician-Grade II. The assistant QC managers must have the same certification except Concrete Laboratory Testing Technician-Grade I instead of Grade II is acceptable.

The QC manager must review and sign the sampling, inspection, and test reports before submitting them. The QC manager or his assistant must be present for:

1. Each stage of mix design
2. Trial slab construction
3. Test strip construction
4. Production and construction of JPCP-RSC
5. Meetings with the Engineer relating to production, placement, or testing

The QC manager must not be a member of this project's production or paving crews, an inspector, or a tester. The QC manager must have no duties during the production and placement of JPCP-RSC except those specified for QC.

40-5.01D(5) Mix Design for RSC

40-5.01D(5)(a) General

Section 40-1.01D(5) does not apply.

40-5.01D(5)(b) Mix Design

The maximum ambient temperature range for a mix design is 18 degrees F. Submit more than 1 mix design based on ambient temperature variations anticipated during JPCP-RSC placement. Each mix design must include:

1. Mix design identification number
2. Aggregate source
3. Opening age
4. Aggregate gradation
5. Types of cement and chemical admixtures
6. Mix proportions
7. Maximum time allowed between batching and placing
8. Range of effective ambient temperatures
9. Time of final setting
10. Modulus of rupture development data from laboratory-prepared samples including tests at the following ages:
 - 10.1. 80 percent of opening age
 - 10.2. Opening age
 - 10.3. 120 percent of opening age
 - 10.4. 1-day when the opening age is less than or equal to 1 day
 - 10.5. 3-day when the opening age is less than or equal to 3 days
 - 10.6. 7-day when the opening age is less than 7 days
 - 10.7. 10-day
 - 10.8. 28-day
11. Shrinkage test result
12. Any special instructions or conditions such as water temperature requirements

Before placing JPCP-RSC, your mix design must be field qualified. Testing must be performed by a technician certified as an ACI "Concrete Laboratory Technician, Grade I" or Grade II Test for modulus of rupture under California Test 524 at the following ages:

1. Opening age
2. 3-day when the opening age is less than or equal to 3 days
3. 10-day when the opening age is more than 3 days

If a mix design is rejected, submit a new mix design and obtain field qualification.

40-5.01D(6) Trial Slabs

Before constructing test strips, Construct 1 trial slab for each mix design and obtain authorization. Trial slabs must:

1. Be 10 by 20 feet
2. Have a thickness of 10 inches or the largest thickness shown, whichever is greater

3. Constructed using the same equipment and methods proposed for paving and under similar atmospheric and temperature conditions expected during paving
4. Demonstrate that JPCP-RSC will be cured, sawed, and comply with the requirement for opening to traffic within the specified lane closures

Place trial slabs near the job site at a mutually-agreed location that is not on the roadway nor within the project limits.

During trial slab construction, sample and split the aggregate for grading, cleanness value, and sand equivalent testing.

Within 20 minutes after RSC delivery for trial slabs, fabricate test beams under California Test 524. Use test beams to determine opening age and 10-day modulus of rupture values.

Cure beams fabricated for early age testing such that the monitored temperatures in the beams and the slab are always within 5 degrees F. Monitor and record the internal temperatures of trial slabs and early age beams at intervals of at least 5 minutes. Install thermocouples or thermistors connected to strip-chart recorders or digital data loggers to monitor the temperatures. Temperature recording devices must be accurate to within ± 2 degrees F. Measure internal temperatures at 1 inch from the top, 1 inch from the bottom, and no closer than 3 inches from any edge until early age testing is completed.

Cure beams fabricated for 10-day testing under California Test 524 except place them into sand at a time that is (1) from 5 to 10 times the final set time or (2) 24 hours, whichever is earlier.

After authorization remove and dispose of trial slabs and testing materials.

40-5.01D(7) Quality Control

40-5.01D(7)(a) General

Section 40-1.01D(7) does not apply.

Provide continuous process control and quality control sampling and testing throughout RSC production and placement. Notify the Engineer at least 2 business days before any sampling and testing.

Establish a testing facility at the job site or at an authorized location.

Sample under California Test 125.

40-5.01D(7)(b) Rapid Strength Concrete

40-5.01D(7)(b)(i) General

Your quality control must include testing RSC for the properties at the frequencies shown in the following table:

RSC Minimum Quality Control

Property	Test method	Minimum testing frequency ^a
Cleanness value	California Test 227	650 cu yd or 1 per shift
Sand equivalent	California Test 217	650 cu yd or 1 per shift
Aggregate gradation	California Test 202	650 cu yd or 1 per shift
Air content	California Test 504	130 cu yd or 2 per shift
Yield	California Test 518	2 per shift
Slump or penetration	ASTM C143 or California Test 533	1 per 2 hours of paving
Unit weight	California Test 518	650 cu yd or 2 per shift
Aggregate moisture meter calibration ^b	California Test 223 or California Test 226	1 per shift
Modulus of rupture	California Test 524	Comply with section 40-5.01D(7)(b)(ii)

^aTest at the most frequent interval.

^bCheck calibration of the plant moisture meter by comparing moisture meter readings with California Test 223 or California Test 226 test results.

Maintain control charts to identify potential problems and assignable causes. Post a copy of each control chart at a location determined by the Engineer.

Individual measurement control charts must use the target values in the mix proportions as indicators of central tendency.

Develop linear control charts for:

1. Cleanness value
2. Sand equivalent
3. Fine and coarse aggregate gradation
4. Air content
5. Slump or penetration

Control charts must include:

1. Contract number
2. Mix proportions
3. Test number
4. Each test parameter
5. Action and suspension limits
6. Specification limits
7. Quality control test results

For fine and coarse aggregate gradation control charts, record the running average of the previous 4 consecutive gradation tests for each sieve and superimpose the specification limits.

For air content control charts, the action limit is ± 1.0 percent of the specified value. If no value is specified, the action limit is ± 1.0 percent of the value used for your approved mix design.

As a minimum, a process is out of control if any of the following occurs:

1. For fine and coarse aggregate gradation, 2 consecutive running averages of 4 tests are outside the specification limits
2. For individual penetration or air content measurements:
 - 2.1. One point falls outside the suspension limit line
 - 2.2. Two points in a row fall outside the action limit line

Stop production and take corrective action for out of control processes or the Engineer rejects subsequent material.

Before each day's concrete pavement placement and at intervals not to exceed 4 hours of production, use a tachometer to test and record vibration frequency for concrete consolidation vibrators.

40-5.01D(7)(b)(ii) Modulus of Rupture

Fabricate and test for modulus of rupture in the Engineer's presence. Fabricate beams for modulus of rupture testing under California Test 524 except beams may be fabricated using an internal vibrator under ASTM C 31.

During JPCP-RSC placement, your quality control testing must include modulus of rupture testing for each day's paving. Test within the first 30 cu yd, at least once every 130 cu yd, and within the final truckload.

Submit split samples and assist the Department in fabricating test beams for the Department's testing unless the Engineer informs you otherwise.

Determine the modulus of rupture at opening age using beams cured and tested under California Test 524. Cure beams under the same conditions as the pavement and until 1 hour before testing. Test 3 beam-specimens in the presence of the Engineer and average the results.

Determine the modulus of rupture at other ages using beams cured and tested under California Test 524 except place them in sand from 5 to 10 times the time of final setting under ASTM C403/C403M or 24

hours, whichever is earlier. For each sample, calculate the test result as the average from testing 3 beams.

A single test result represents no more than 1 paving shift or 130 cu yd, whichever is less. If you wish to increase the testing frequency, you must notify the Engineer at least 2 days before paving. No payment is made for your additional testing.

40-5.01D(7)(c) Concrete Field Qualification

Before paving, your RSC mix design must be field qualified.

For field qualification, determine the modulus of rupture at 10 days using the beams prepared for 10-day modulus of rupture testing at the time of trial slab construction. The 10-day modulus of rupture must be at least:

1. 600 psi for each single beam
2. 650 for the average of 5 beams

40-5.01D(8) Department Acceptance

40-5.01D(8)(a) General

The requirement for testing the modulus of rupture at 28 days in section 40-1.01D(8)(a) does not apply.

40-5.01D(8)(b) Modulus of Rupture

The acceptance requirement for modulus of rupture at 28 days in section 40-1.01D(8)(c)(i) does not apply.

JPCP-RSC is accepted based on your testing for modulus of rupture at opening age and the Department's testing for modulus of rupture at 10 days. For each sample, the Department calculates the test result as the average from testing 3 beams. The test result represents 1 paving shift or 130 cu yd, whichever is less.

If the opening age is equal to or less than 3 days, JPCP-RSC must have a modulus of rupture at opening age that is at least 400 psi and a modulus of rupture at 10 days that is at least 650 psi.

If the opening age is between 3 and 9 days, JPCP-RSC must have a modulus of rupture at opening age that is at least 550 psi and a modulus of rupture at 10 days that is at least 650 psi.

If the opening age is equal to or less than 3 days, the modulus of rupture at opening age is at least 400 psi, and the modulus of rupture at 10 days is at least 570 psi but less than 650 psi, you may request authorization to leave the JPCP-RSC in place and accept the specified deduction.

If the opening age is between 3 and 9 days, if the modulus of rupture at opening age is at least 550 psi, and the modulus of rupture at 10 days is at least 570 psi but less than 650 psi, you may request authorization to leave the JPCP-RSC in place and accept the specified deduction.

40-5.02 MATERIALS

40-5.02A General

Sections 40-1.02B(1) and 40-1.02B(2) do not apply.

RSC must comply with 90-3. The 2nd paragraph of section 90-1.02I(2)(a) does not apply.

RSC shrinkage limitations for pavement must be limited to 0.040 percent under section 90-1.02A when tested under section 90-3.01D(5).

40-5.02B Aggregate

Comply with section 40-1.02B(3) except aggregate must be either:

1. Innoxious
2. Such that the RSC has an expansion ratio of less than 0.10 percent under ASTM C 1567 with the proposed proportion and mix design. Include test data with the mix design submittal. Test data must

be dated within 3 years of the contract award date. The test data must be for the same mix design and based on aggregate from the same proposed source and proportion.

40-5.03 CONSTRUCTION

40-5.03A General

If the cement in JPCP-RSC is other than portland cement, section 40-1.03I does not apply, and the pavement must be cured per the cement Manufacturer's written recommendations.

Do not place JPCP-RSC if the opening age is less than or equal to 3 days and the temperature is forecasted to be less than 40 degrees within 72 hours of final finishing. Use the forecast from the National Weather Service.

40-5.03B Joints

Section 40-1.03B(2) does not apply.

Before placing JPCP-RSC against existing concrete, place 1/4-inch thick commercial quality polyethylene flexible foam expansion joint filler across the original transverse and longitudinal joint faces. Place the top of the joint filler flush with the top of the pavement and extend it down to the bottom of excavation. Secure joint filler to the joint face of the existing pavement and prevent it from moving during the placement of JPCP-RSC.

Where the existing transverse joint spacing in an adjacent lane exceeds 15 feet, construct an additional transverse contraction joint midway between the existing joints. If transverse joints do not align in a curve, drill a full depth 2-inch diameter hole under ASTM C 42/C 42M where the joint meets the adjacent slab. Fill the hole with joint filler material. Do not allow the filling material to penetrate into unsealed joints.

In addition to the specifications in section 40-1.03B(4), after removing new pavement, clean the faces of joints and remove loose material and contaminants from underlying base. Coat the base surface with curing compound under section 28-2.03F.

40-5.03C Placing Concrete

The 3rd paragraph of section 40-1.03F(1) does not apply.

Place consecutive concrete loads without interruption. Do not allow cold joints where a visible lineation forms after concrete is placed, sets, and hardens before additional concrete placed.

After mixing and placing JPCP-RSC, do not add water to the surface to facilitate final finishing. You may request authorization to use a surface finishing additive; include the manufacture's recommendations with you request.

40-5.03D Protecting Concrete Pavement

If the opening age is equal to or less than 3 days, section 40-1.03J does not apply. Protect pavement under section 90-1.03C . Protect JPCP-RSC from activities that cause damage, reduce texture, and reduce the coefficient of friction. Do not allow soil, gravel, petroleum products, concrete, or asphalt mixes on the JPCP-RSC surface.

40-5.03F Early Use of Concrete Pavement

Section 40-1.03K does not apply.

40-5.04 PAYMENT

If the JPCP-RSC has a modulus of rupture at 10 days that is less than 650 psi, the Department deducts 10 percent of the payment for JPCP-RSC.

AA

DIVISION IX TRAFFIC CONTROL DEVICES

83 RAILINGS AND BARRIERS

Replace section 83-2.04B with:

83-2.04B Alternative In-line Terminal Systems

83-2.04B(1) General

83-2.04B(1)(a) Summary

Section 83-2.04B includes specifications for constructing alternative in-line terminal systems.

83-2.04B(1)(b) Definitions

Not Used

83-2.04B(1)(c) Submittals

Submit a certificate of compliance for alternative in-line terminal systems.

83-2.04B(1)(d) Quality Assurance

For each model of alternative in-line terminal system being installed, obtain the manufacturer's check list for the assembly and installation of the alternative in-line terminal systems from the manufacturer's representative or distributor. Notify the Engineer of the alternative in-line terminal systems to be installed at each location before starting installation activities. Complete, sign, and date the check list for each installed in-line terminal system and submit a copy of the completed and signed check list for each installed location, and include the following:

1. Contract number
2. Name of installation Contractor
3. Flare offset used in layout
4. Date of installation
5. Location on the project by post mile, and by station if stationing shown on plans
6. Name and signature of individual completing the checklist.

The Engineer signs and dates the completed check lists, verifying the in-line terminal system at each location was assembled and installed under the manufacturer's instructions and as described.

Use personnel trained by the manufacturer to install in-line terminal systems. A record of training provided by the manufacturer may be requested by the Engineer at any time.

83-2.04B(2) Materials

Alternative in-line terminal systems must be one of the following or a Department-authorized equal:

1. Type SoftStop terminal systems must be SoftStop End Terminal System manufactured by Trinity Highway Products, LLC, and must include the connection components. Type SoftStop terminal system - Type SoftStop terminal system must be a SoftStop terminal with a System length of 50'-9 1/2" for test level 3, manufactured by Trinity Highway Products, LLC, and must include items detailed for SoftStop terminal system, as shown. The SoftStop terminal can be obtained from the manufacturer:

Address	Telephone no.
TRINITY HIGHWAY PRODUCTS LLC PO BOX 99 CENTERVILLE UT 84012	(800) 772-7976

- Type MSKT - Type MSKT terminal system must be a 31" MSKT Guard Rail End Terminal with a system length of 50'-0" as manufactured by Road Systems, Inc., located in Big Spring, Texas, and must include items detailed for Type MSKT terminal system shown on the plans. The MSKT Guard Rail End Terminal can be obtained from the distributor:

Address	Telephone no.
UNIVERSAL INDUSTRIAL SALES PO BOX 699 PLEASANT GROVE UT 84062	(801) 785-0505
GREGORY INDUSTRIES INC 4100 13TH ST SW CANTON OH 44708	(330) 477-4800

- Type MAX-Tension Tangent Guardrail End Treatment by Barrier Systems, Inc. is a tangent, re-directive gating guardrail terminal. The MAX-Tension has a length of 55'-1/2", and can be flared for an offset of 0 to 2 feet at the head. The MAX-Tension terminal can be obtained from the distributor:

Address	Telephone no.
STATEWIDE SAFETY AND SIGNS INC 130 GROBRIC COURT FAIRFIELD CA 94533	(800) 770-2644

83-2.04B(3) Construction

Identify each terminal system by painting the type of terminal system in 2-inch-high, neat, black letters and figures on the backside of the rail element between system posts number 4 and 5. Paint must be metallic acrylic resin type spray paint. Before applying terminal system identification, the surface to receive terminal system identification must be free of all dirt, grease, oil, salt, or other contaminants by washing the surface with detergent or other suitable cleaner. Rinse thoroughly with fresh water and allow to fully dry.

Install Type SoftStop terminal system under the manufacturer's installation instructions. For Type SoftStop terminal system, use W6 x 8.5 steel yielding terminal posts for Posts 1 and 2 and standard W6 x 8.5 steel posts for the other posts. Drive all posts or place them in drilled holes. Backfill the space around the posts with selected earth that is free of rock. Moisten and thoroughly compact each layer. For the terminal with a system length of 50'-9 1/2" or system length of 38'-3 1/2", all blocks must be wood or plastic and must be 8 or 12 inches deep.

For Type MSKT terminal system, install a W6x15 at lower section Post 1 with a soil plate attached and a 6 by 6 by 1/8 inches tube section at upper section Post 1. Install a W6x9 or W6x8.5 post assembly top and post assembly bottom at Post 2. Install W6x9 or W6x8.5 at Posts 3 through 8. Attach a 9'-4 1/2" W-beam MGS rail section to Post 3. Use 8-inch blocks. The posts must be, at your option, driven with or without pilot holes, or placed in drilled holes. Do not pound on the side plates when installing lower post #1 and lower post #2. Space around the posts must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted.

Install Type MAX-Tension terminal system under the manufacturer's installation instructions. Use 8- or 12-inch wood or composite blocks. Install W6x8.5 or W6x9 at post positions after Post 1. Backfill the space around the posts with selected earth that is free of rock. The posts must be, at your option, driven with or without pilot holes, or placed in drilled holes. Space around the posts must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted.

83-2.04B(4) Payment

Not Use

Replace section 83-4.07 with:

83-4.07 ALTERNATIVE CRASH CUSHION SYSTEM

83-4.07A General

83-4.07A(1) Summary

Section 83-4.07 includes specifications for constructing alternative crash cushion systems, including foundations, transitions, and hardware required to connect to a structure or barrier as described.

83-4.07A(2) Definitions

Not Used

83-4.07A(3) Submittals

Submit a certificate of compliance for each model of crash cushion system.

At least 10 days before installation, for each model of crash cushion system used on the project, submit at least two copies of the following:

1. Manufacturer's:
 - 1.1. Instruction manuals with installation checklists
 - 1.2. Maintenance manuals
2. List of installation locations

As each crash cushion system is installed, complete the manufacturer's installation checklist and include the following:

1. Contract number
2. Name of installation Contractor
3. Type of crash cushion system installed
4. Date of installation
5. Location by post mile and by station if stationing is shown
6. Name and signature of person completing the checklist

For each crash cushion system installed, submit a completed manufacturer's checklist within 10 days after installation. The checklist must be completed by personnel that have been trained by the manufacturer.

83-4.07A(4) Quality Assurance

Personnel trained by the manufacturer must be on site during installation. Provide list of trained personnel to the Engineer.

83-4.07B Materials

Concrete must comply with the specifications for minor concrete and the manufacturer's strength requirements.

Reinforcement must comply with section 52.

Alternative crash cushion system must meet test level 3 criteria and must be one of the following or a Department-authorized equal:

1. CRASH CUSHION (TYPE SCI-100GM) - The Type SCI-100GM is a potentially reusable, re-directive, non-gating, bidirectional, impact crash cushion for roadside features of 24" width with the use of an approved transition. The system length is 21'-6". The Type SCI-100GM can be obtained from the following distributors:

Address	Telephone and fax nos.
WORK AREA PROTECTION CORPORATION 2500 PRODUCTION DRIVE ST. CHARLES IL 60174-9081	Telephone: (800) 327-4417 Fax: (614) 340-6296
D&M TRAFFIC SERVICES INCORPORATED 845 REED STREET SANTA CLARA CA 95050	Telephone: (408) 436-1127 Fax: (408) 436-1675

2. CRASH CUSHION (QUADGUARD M10, 6-bay) - The Type QuadGuard M10, 6-bay, is a potentially reusable, re-directive, non-gating crash cushion for roadside features of 24" in width with use of an approved transition. The system length is 21'-11". The Type QuadGuard M10, 6-bay must be a QM10024 Tension Strut Backup or Concrete Backup with a backup width of 24 inches. The QuadGuard M10, 6-bay crash cushion can be obtained from the following manufacturer or distributor:

Address	Telephone and fax nos.
TRINITY HIGHWAY-ENERGY ABSORPTION 70 WEST MADISON STREET, SUITE 2350 CHICAGO IL 60602	Telephone: (888) 323-6374 Fax: (800) 770-6755
TRAFFIC MANAGEMENT INCOPORATED 5806 PERRIN AVENUE McCLELLAN CA 95652 e-mail: trinity@trafficmanagement.com	Telephone: (510) 289-6975

3. CRASH CUSHION (TAU-M, 7-bay) - The Type TAU-M, 7-bay, is a potentially reusable, re-directive, non-gating crash cushion for roadside features of up to 27.5 inches in width with use of an approved transition. The Type TAU-M has a system length of 23'-11". The Type TAU-M crash cushion can be obtained from the distributor:

Address	Telephone and fax nos.
STATEWIDE SAFETY AND SIGNS INCORPORATED 130 GROBRIC COURT FAIRFIELD CA 94533	Telephone: (800) 770-2644 Fax: (707) 864-9956

83-4.07C Construction

For each model of crash cushion system being installed, have a copy of the Caltrans approved manufacturer's drawings and installation manual onsite for reference.

Attach a manufacturer-supplied retroreflective marker panel to the front of the crash cushion if the closest point of the crash cushion is within 12 feet of the traveled way. Install Left, Right, or Median marker as appropriate. Firmly attach the marker panel to the crash cushion as recommended by the manufacturer or by other authorized methods.

Do not install crash cushion system over expansion joints or drainage basins.

Install Type SCI-100GM crash cushion under the manufacturer's installation instructions. Foundations must be a flat surface with longitudinal and cross slopes of 10:1 or less. Concrete foundations must reach full cure strength before use and the surface of the foundation must be cleaned of all debris, dirt, mud, etc.

Install Type QuadGuard M10, 6-bay crash cushion under the manufacturer's installation instructions. The QuadGuard M10, 6-bay must be a Tension Strut Backup or a Concrete Backup. A transition panel or side panel must be used on each side of the backup. The QuadGuard M10, 6-bay must only be assembled on an existing or freshly placed and cured concrete base. Cross-slope shall not exceed 8% and must not twist more than 2 percent over the length of the system. Concrete anchorage devices used for attaching the crash cushion to the base slab must be limited to those provided by the manufacturer.

Install Type TAU-M, 7-bay crash cushion under the manufacturer's installation instructions. The TAU-M, 7-bay must be connected to the barrier using the manufacturer's recommended transition. A transition panel or side panel must be used on each side of the backup. The TAU-M, 7-bay must only be

Add to section 84-2.03B(1) of the RSS for section 84-2:

The retroreflectivity of applied preformed thermoplastic pavement markings must comply with the requirements shown in the following table:

Preformed Thermoplastic Retroreflectivity Requirements

Traffic stripe material	White (min, mcd ^{m-2} lx ⁻¹)	Yellow (min, mcd ^{m-2} lx ⁻¹)	Other colors (min, mcd ^{m-2} lx ⁻¹)
Preformed thermoplastic	250	125	125

The applied preformed thermoplastic pavement marking must have a skid resistance value of 60.

Add to section 84-2.03B(2) of the RSS for section 84-2:

84-2.03B(2)(e) Preformed Thermoplastic Pavement Markings

After cleaning the surfaces, apply sealer or primer as recommended by the manufacturer.

Apply the preformed thermoplastic under the manufacturer's instructions. You may use a surface preparation adhesive to precondition the pavement surface.

Preformed thermoplastic pavement markings must be ready for traffic immediately after application.

Add to section 84-2.03B(7) of the RSS for section 84-2:

Contrast for preformed thermoplastic pavement markings consists of a black border with a width from 2 to 4 inches. The borders must be nonreflective film bonded to the outer edge of the marking.

Replace section 84-9.03B of the RSS for section 84-9 with:

84-9.03B Remove Traffic Stripes and Pavement Markings Containing Lead

Residue from the removal of painted or thermoplastic traffic stripes and pavement markings contains lead from the paint or thermoplastic. The average lead concentrations are less than 1,000 mg/kg total lead and 5 mg/L soluble lead. This residue:

1. Is a nonhazardous waste
2. Does not contain heavy metals in concentrations exceeding the thresholds established by the Health and Safety Code and 22 CA Code of Regs
3. Is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Management of this material exposes workers to health hazards that must be addressed in your lead compliance plan.

1. Foundations
2. Pull boxes
3. Conduit
4. Cables
5. Conductors
6. Detectors
7. Piezoelectric axle sensors
8. Controller cabinet
9. Traffic counter assembly
10. Wireless data system

The components of a census station system are shown on the project plans.

87-10.01B Definitions

traffic counter: A traffic counter is an automatic device which counts, classifies, and measures the speed of vehicular traffic passing along a given roadway. A traffic counter must be an automated traffic counter (ATC) as shown on the plans.

87-10.01C Submittals

Not Used

87-10.01D Quality Assurance

87-10.01D(1) General

Not Used

87-10.01D(2) Department Acceptance

87-10.01D(2)(a) General

Not Used

87-10.01D(2)(b) Department Testing

A traffic counter assembly acceptance is based on:

1. Collecting data locally and remotely, meeting the accuracy specifications, for a minimum of 5 consecutive days
2. Successfully processing downloaded-files for input in Caltrans Transportation System Network (TSN) database

The traffic counter assembly acceptance test for each lane of travel must consist of the following:

1. Vehicle counts must be collected simultaneously from the traffic counter assembly and manually. A minimum of 100 vehicle counts must be collected for each lane. The accuracy of the collected data from the traffic counter assembly must be within ± 3 percent of the manually collected data.
2. The traffic counter assembly must be monitored for 5 consecutive days. The traffic counter assembly must record and store data for 5 consecutive days. If the traffic counter assembly fails to record and store data for an accumulated time of 3 hours during the 5 day period, then this is cause for the acceptance test to be rejected and repeated.

87-10.02 MATERIALS

87-10.02A General

Not Used

87-10.02B Traffic Counter Assembly

87-10.02B(1) General

A traffic counter assembly consists of a traffic counter and traffic counter firmware.

87-10.02B(2) Traffic Counter

87-10.02B(2)(a) General

Each traffic counter component must be furnished by the following manufacturer:

Oriux
 5401 N Sam Houston Parkway West
 Houston, TX 77086
 Telephone (281) 453-0200

Component is as follows

Counter Type	Part Number	Description	
Automated Traffic Counter	100AVCC	ADR3019, 4L, 4P, KD, PWR1, AM/SP	
	81-292-AG	External Sensor Harness	

87-10.02B(2)(b) Traffic Counter Firmware

The firmware must be compatible with all existing traffic counters. Access to stored data in the traffic counter must be available through personal computers, both laptop and desktop with Windows XP, Windows 7, or newer operating system via standard TIA-232 interface. Remote access must be available through a modem, either hard wired or wireless.

87-10.03 CONSTRUCTION

Connect the field wiring to the terminal blocks in the cabinet. The Engineer provides you a list of field conductor terminations for the cabinet.

Perform the conductor and operational tests for the system.

87-10.04 PAYMENT

Not Used

**Replace section 87-17 with:
 87-17 WIRELESS DATA SYSTEM**

87-17.01 General

87-17.01A Summary

Section 87-17 includes specifications for installing the Wireless Data System in the controller cabinet.

87-17.01B Definitions

LARTMC:

Los Angeles Regional Transportation Management Center.
 2901 W Broadway St, Los Angeles, CA 90041

87-17.01C Submittals

Submit signal strength measurements report for acceptance.
 Submit certificates of compliance and warranty documentation before installation.

87-17.01C(1) Warranty

Furnish a 5-year replacement warranty from the manufacturer of the modems and power supplies against any defects or failures. The effective date of the warranty is the date of installation. Furnish replacement modems and power supplies within 5 days after receipt of the failed parts. The Department does not pay for the replacement parts. Deliver replacement modems and power supplies to LARTMC.

87-17.02 Materials

87-17.02A General

The Wireless Data System consists of:

1. cellular router
2. hardened DIN-rail power supply
3. mounting hardware
4. serial or ethernet cable
5. antenna
6. software
7. low loss adapter
8. cable and wire management components and
9. sealant.

The Wireless Data System must be installed in the Census Station cabinet and be compatible with ITS software communications.

No modification must be required for the Wireless Data System to work with all of above existing hardware and software.

87-17.02A(1) Cellular Router

The cellular router must, at a minimum, meet the following specifications:

Cellular Router	
Ethernet Downlink Interface	At least 3 10/100 Mbps 8P8C Ethernet ports
Cellular Interface	<p>At least 2 mini SIM slots 2FF form factor Must be certified to operate on both Verizon and AT&T Must support dynamic cellular Wireless Wide Area Network (WWAN) switching</p> <p>LTE features: Bit rate 100 Mbps Down Link (DL) / 50 Mbps Up Link (UL), 3GPP release 8 standard; User Equipment (UE) CAT. 3 Output power: Class 3 (+23dBm ±2 dB) Supported bandwidths: 5 MHz, 10 MHz, 20 MHz Supported frequencies: 700 (B13) / 700 (B17) / 850 (B5) / AWS (B4) / 1900 MHz (B2)</p> <p>HSPA+ features: Bit rate 42 Mbps (DL) / 5,76 Mbps (UL), 3GPP rel. 7 standard; UE CAT. 14, 24 Data compression 3GPP TS25.212 Supported frequencies: 850 (BV) / AWS (BIV) / 1900 MHz (BII)</p> <p>UMTS features: PS bit rate 384 kbps (DL) / 384 kbps (UL) Output power: Class 3 (+24dBm +1/-3 dB) Supported frequencies: 850 (BV) / AWS (BIV) / 1900 MHz (BII)</p> <p>GPRS/EDGE features: Bit rate 237 kbps (DL) / 59,2 kbps (UL) GPRS multi slot class 12, CS 1 to 4 EDGE multi slot class 12, CS 1 to 4, MCS 1 to 9 Supported frequencies: 850 / 900 / 1800 / 1900 MHz</p> <p>GPRS/EDGE power classes: EGSM 850 / 900: Class 4 (+33dBm ±2 dB) GSM 1800 / 1900: Class 1 (+30dBm ±2 dB) GSM 850 / 900: Class E2 (+27dBm ±3 dB) GSM 1800 / 1900: Class E2 (+26dBm +3/-4 dB)</p>
Serial Interfaces	At least 1 RS-232 Serial Port on 4-pin terminal block At least 1 RS-485 Serial Port on 3-pin terminal block
Other interfaces	At least 1 USB 2.0 Host connector At least 1 Micro SD card slot
Antenna interfaces	At least 3 SMA type Antenna ports (ANT, DIV, GPS) At least 1 R-SMA type Wi-Fi Antenna port
GNSS	Antenna: 50 Ohms – active Protocols: NMEA 0183 v3.0 Frequency GPS: 1575.42MHz Typical Tracking Sensitivity (Open sky): Active antenna or LNA: -159 dBm Passive antenna: -156 dBm Acquisition Sensitivity (Open sky): Active antenna or LNA: -149 dBm Passive antenna: -145 dBm Cold Start Sensitivity: -145 dBm Acquisition time (TTFF): Warm start: 29 s Max.

	Cold start: 32 s Max.
Wi-Fi	802.11 A/B/G/N, AP or client modes Supported Wi-Fi band: 2.4 GHz, 5 GHz Encryption: None, WEP, TKIP, AES 5 GHz supported channels: 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165 2.4 GHz supported channels: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 Number of clients: 10 Authentication: Open, Shared, WPA-PSK, WPA2-PSK
Software Requirements	Network and Routing: DHCP Server, , DHCP Client, NAT/PAT, VRRP, Dynamic DNS client, DNS proxy, VLAN, QoS, NTP Client/ Server, IGMP, BGP, OSPF, RIP, SMTP, SMTPS, SNMP v1/ v2c/ v3, Backup routes, PPP, PPPoE, SSL, Port Forwarding, Host Port Routing, Ethernet Bridging Security: HTTPS, SSH, VPN tunnels, SFTP, Firewall (IP Filtering, MAC address filtering, Inbound and outbound Port filtering), DMZ (via iptables) VPN Tunnelling: Open VPN client and server and P2P, L2TP, PPTP, GRE, EasyVPN, DMVPN, IPSec with IKEv1 and IKEv2 Configuration: Web server, SSH, Four configuration switchable profiles, Automatic configuration update from server Backup configuration, Restore configuration Firmware Management: Automatic firmware update from server, Locally via LAN and USB or remotely OTA (HTTP, HTTPS), Over-the-Air software updates, Over-the-Air cellular module update from FW Diagnostic: One CLICK report – current configuration / factory identification / system log / kernel log / reboot log / routing table, Remote diagnostics possible via SSH Status: Network Status, DHCP Status, IPSec Status, Statistics history for last 60 days Log: System Log, Reboot Log, Kernel Log Controlling and Diagnostic: SMS, SNMP v1/v2c/v3, Statures, Log Event Engine: Start Up script & Up/Down script (Bash), Digital Input, Network Parameters, Data Usage, Timer, Power, Device Temperature Report Types: RAP, SMS, email, SNMP Trap Other: IPv6 support
Environmental Requirements	Minimum Range of Operating Temperature: -40 to +167 °F Storage: -40 to +185 °F Minimum Range of Operating Humidity: 0 to 95 % Storage (Non-condensing): 0 to 95 % Cold Start -31 °F Operating Altitude: 2000 m / 70 kPa Ingress Protection Rating: IP30
Mechanical Requirements	Fan-less design Maximum Device Size (H x W x D): 4" x 6" x 6" Integrated mounting including either 4 keyhole screw mounts in 19" rack or mounting bracket using DIN rail
Power Requirements	Power Supply: 10 - 60 VDC (2-Way Molex connector) Maximum Power Consumption: Idle: 2.5 W Average: 4 W

	Peak: 11 W Sleep Mode: 10mW
Emission	ETSI EN 301 511 v9.0.2, ETSI EN 300 440-2 v1.4.1 ETSI EN 300 328 v1.8.1, ETSI EN 301 489-17 v2.2.1 FCC 15.107 Class B, FCC 15.109 Class B FCC ID 2AIQR-SR305, Contains: FCC ID 2AIQR-PLS8-X, IC ID 7830A-PLS8X.WiFi versions contain FCC ID Z64-WL18DBMOD, IC ID 4511-WL18DBMOD. PTCRB ETSI EN 301 489-1 v1.9.2, IEC 61000-6-2:2005, IEC 61000-6-3:2006
Safety	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013, EN 62311:2008 UL C1D2 and ATEX: UL 60950-1, 2nd ed. + am1 + am2 CAN/CSA C22.2 No. 60950-1-07, 2nd ed. + am1 + am2 UL E4861 ATEX II 3 G Ex nA IIC T4 Gc, DEMKO 16 ATEX 1801X

The cellular router must:

1. Be configurable remotely through the cellular network and locally through the router serial and Ethernet port.
2. Be configured before acceptance.
3. Have a minimum 53.6 Kbps raw data transfer rate for serial port
4. Have a full duplex transceiver for both serial and Ethernet port.
5. Be fully compatible with existing cellular (mobile) network carrier used in District 7 TMC field network and be compatible with 4G cellular (mobile) networks with fall back to 3G. The contractor must contact District 7 TMC Support office to find out:
 - Cellular (mobile) network currently used in District 7 TMC field network
 - List of approved cellular routers

At the following address and phone number:
TMC Support Unit, ITS, Division of Operations, District 7, Caltrans LARTMC
2901 W Broadway St, Room 407, Los Angeles, CA 90041,
Office: 323-259-1833
6. Have an integrated TCP/IP stack with user datagram protocol (UDP).
7. Have a user-settable password to prevent unauthorized access.
8. Include a DC power cable at least 3 feet long with a connector compatible with the cellular router power connector (2-way Molex)
9. Operate in a static IP address environment of 4G networks (with fall back to 3G) at their designated frequency bands for existing cellular (mobile) network carrier used in District 7 TMC field network and meet the requirement of receiver sensitivity of at least -90dBm.

The cellular router and associated firmware, software, hardware, protocol, and other features must be fully compatible with the existing cellular (mobile) network carrier used in District 7 TMC field network and this required compatibility must be demonstrated to Caltrans designated Engineer by actual installation or by other authorized means.

87-17.02A(2) Hardened DIN-Rail Power Supply

Hardened DIN-rail power supply must, at a minimum, meet the following specifications:

Hardened DIN-Rail Power Supply	
Output Requirements	Output Voltage: 24VDC Output Voltage Adjustment Range: 22VDC to 27VDC Rated Current: 1.67A Peak Current: (Max Output Current, 3 seconds) 2.50A Output Power 40 Watts
Input Requirements	Input Voltage: 85 - 264 VAC; 110 - 375 VDC Input Frequency: 47 - 63 Hz Input Current < 0.93 A @ 115VAC, < 0.40 A @ 230VAC
Protection Requirements	OVP (Over Voltage Protection): 35V max OCP (Output Peak Current Protection, 3-5 sec.): 2.50A SCP (Short Circuit Protection) < 0.1 ohm OTP (Over Temperature Protection): 100 ± 10%
Environmental Requirements	Operating Temperature -13 to +158 °F Cold Start -40°F Operating Humidity 5 to 95% RH, non-condensing Storage Temperature -40 to +185 °F Operating Altitude 5,000 m
Safety and EMC Emissions Requirements	CB/UL/TUV/CCC: IEC60950-1/GB4943.1 EMC Emission EN55032 (CISPR32), EN61000-3-2, EN61000-3-3, EN55011 EMC Immunity EN61000-4-2,3,4,5,6,8,11, EN55024, EN61000-6-2, EN61000-6-4, EN61204-3, heavy industry level, criteria A, SEMI F47
Mechanical Requirements	Fan-less design Maximum Device Size (H x W x D): 3" x 6" x 6" DIN-Rail mounting EN60715 Metal Case Input Connector: 3 Pins (300V/ 20A) Output Connector: 4 Pins (300V/ 20A) Terminal Type: Screw Terminal Wire AWG22-16
Reliability and Warranty Requirements	MTBF (hours): 500,000 (based on SR-332) Warranty: 5 Years

87-17.02A(3) Mounting Hardware

Cellular router mounting hardware must include 4 self-tapping screws and washers that match the keyhole screw mounts or mounting bracket of the cellular router for 19-inch rack mounting. For DIN-rail mounting, the cellular router must have DIN-rail mounts attached to the device, that can be mounted to DIN-rails inside cabinets. If DIN-rail is not available inside cabinets then DIN-rail 19-inch rack mount kit can be used where a DIN-rail is available inside a rack mounted kit.

The mounting must:

1. Be made of stainless steel or Aluminum.
2. Securely hold the cellular router and the hardened DIN-rail power supply in a vertical position with all cables and conductors installed.
3. Hold the cellular router and the hardened DIN-rail power supply using a method that allows the removal of the router and the power supply devices without tools or without removing the bracket from its attachment to the cabinet frame.

87-17.02A(4) Serial or Ethernet Cable

The serial cable connects the 170 controller to the cellular router and includes all conductors and connectors required for that purpose. The connectors for the cellular router end for serial cable must be able to connect to 4-pin terminal block for the RS-232 serial port and 3-pin terminal block plug for the RS-485 serial port at the cellular router. The controller side connectors for the serial cables must be C2 type. The C2 connector for the Department-furnished controller must comply with AMP 201360-2 or equivalent. All pins in both connectors must be gold plated. The cable must have no. 20 AWG conductors with (UL) Type CM shielded or AWM 2464 80C 300 Volts. The cable must be at least 3 feet long.

The ethernet cable connects the 2070 controllers to the cellular router. The ethernet cable must be CAT-5E type network patch cable which must be manufacturer certified as TIA/EIA-568-B standard compliant. Connectors at both ends of the CAT-5E patch cables must be 8P8C-type modular connectors using T568B termination. Appropriate length must be used for all cables with sufficient length to allow for cable organization using cable ties but cable lengths must not exceed 368 feet.

87-17.02A(5) Antenna

The cellular router antenna must:

1. Be low profile design for outdoor surface bolt mount.
2. Be Omni-directional with vertical polarization and must match the supported modem frequency bands.
3. At a minimum meet the following requirements:
 - a. (2) LTE 4G, 3G, 2G MiMo 690~960/ 1710~2170/ 2500~2700 MHz
 - b. Wi-Fi 2.4~2.5 GHz
 - c. DSRC 5.8~6 GHz
 - d. GPS 1575.42 ± 1.023 MHz
 - e. IP67 Water and Dust Migration Protection
 - f. RG174 Low Loss Cable
 - g. SMA Connectors (4 Male / 1 RP Male - Wi-Fi)

87-17.02A(6) Software

Cellular router internal installed software must include user manual. The user manual and system manual must describe the function of all configuration parameters used by the software, describe default values and provide valid range or values for all configuration settings.

The internal installed software at the cellular router must support the following management functions locally through device ports and remotely using over the air interface:

- control
- configuration
- firmware upgrades
- diagnostics
- monitoring of signal level at receiver, and
- resetting of the cellular router.

The internal installed software at the cellular router must support above management function access individually using SSH, telnet etc. or by using central management software.

87-17.02A(7) Low Loss Adapter

Low loss adapter must be a SMA socket to BNC plug low loss in-line straight adapter. Low loss adapter must comply with the following requirements:

Nominal Impedance	50-Ohm
Operating Frequency Range	0 to 2 GHz
Maximum VSWR	1.2
Maximum Insertion Loss	0.1 dB
Operating Temperature	-25 to +170 °F
Body Finish	Gold or Nickel plated
Contacts Finish	Gold plated
Body Materials	Beryllium Copper or Brass

87-17.02A(8) Cable and Wire Management Components

Cable and wire management components include cable ties, wire and cable mounting devices, non-metallic strain reliefs, fixed diameter clamps, and wire management brackets.

87-17.02A(9) Sealant

Sealant must be UL listed heat resistant, weatherproof, waterproof, watertight and high temperature silicone sealant, withstand -45 to +200 degrees F, and resist vibration.

87-17.03 Construction

The Cellular Router installation may be adjusted for field conditions if authorized by Engineer.

Equipment installation must not affect the normal movement of the controller cabinet's doors. Use wire management brackets every 1 foot in the cabinets to route cable. Use cables and wire management system components in the controller cabinet and equipment rack to avoid physical interference between cables and adjacent equipment, to allow equipment to be removed from controller cabinet without physical interference, and to keep terminal blocks clearly visible.

Comply with the manufacturer's installation instructions and recommendations to avoid equipment damage during installation. Cellular Router must be mounted using mounting hardware, connected to:

-
- Ethernet port in ADR 3000.

connected to SMA Cellular network connector of antenna, and connected to hardened DIN-rail power supply. Antenna must be surface mounted and connected to the Cellular Router. Hardened DIN-rail power supply must be connected to an equipment outlet, not to a controller outlet, in the power distribution assembly (PDA) and to the Cellular Router.

Use a serial cable or ethernet cable, a laptop computer, the management software, and the Cellular Router to measure signal strength. Before Cellular Router antenna is permanently installed, conduct signal strength measurements and add measurements to signal strength measurements report.

If signal strength measurements report shows that the radio signal is below the signal strength specifications (-90 dBm), then a more powerful antenna or a combination of antenna and booster device with higher gain must be installed to bring the measured signal strength above the signal strength specifications (-90 dBm).

After acceptance of the signal strength measurements report, install the Cellular Router, the mounting hardware, the hardened DIN-rail power supply, and the router serial cable or ethernet cable. The mounting hardware must secure in place the Cellular Router to a mounting plate and mounting screws must not touch the cabinet walls. Measure the radio signal strength in dBm, verify that the radio signal exceeds the signal strength specifications (-90 dBm), and add measurements to signal strength measurements report.

Water deflection assemblies must not be damaged and must be re-installed if removed during the installation of the antenna.

1. The 5-digit number that follows "99-" and the title of each correlate with the 16-division CSI MasterFormat number and title except as specified below.
2. Within section 99, the Department is gradually changing the specifications to align with CSI's MasterFormat styles and 50-division CSI MasterFormat numbers. Because of this transition, the format, organization, and language may vary between sections. Until the transition is complete, a 50-division section number that follows "99-" will be located in the division that correlates with the 16-division CSI MasterFormat.
3. Some section 99 specifications are in a streamlined form. In these specifications, interpret a colon as "must be."

E. Section 99 specifications are located in the divisions as shown in the following table of contents:

Section 99 Table of Contents	
DIVISION 99-1 GENERAL REQUIREMENTS	
	99-010000 GENERAL REQUIREMENTS
	99-01050 FIELD ENGINEERING
DIVISION 99-2 SITEWORK	
	99-02071 REMOVING PORTIONS OF EXISTING FACILITIES
	99-02220 EARTHWORK FOR BUILDING WORK
	99-02236 FREE DRAINING GRANULAR MATERIAL
	99-02585 PAINTED PAVEMENT MARKINGS
	99-02842 GUARD POSTS
	99-02846 ACCESSIBLE AND UNAUTHORIZED PARKING SIGNS
DIVISION 99-3 CONCRETE AND REINFORCEMENT	
	99-03300 CAST-IN-PLACE CONCRETE
DIVISION 99-4 MASONRY	
	(Not Used)
DIVISION 99-5 METALS	
	(Not Used)
DIVISION 99-6 WOOD AND PLASTICS	
	(Not Used)
DIVISION 99-7 - THERMAL AND MOISTURE PROTECTION	
	99-07920 SEALANTS
DIVISION 99-8 DOORS AND WINDOWS	
	99-08710 DOOR HARDWARE
	99-08810 GLAZING
DIVISION 99-9 FINISHES	
	99-09250 GYPSUM WALLBOARD
	99-09614 DETECTABLE WARNING SURFACE
	99-09659 RESILIENT BASE
	99-09661 VINYL COMPOSITION TILE
	99-09900 PAINTING
	99-09953 FIBERGLASS REINFORCED PLASTIC PANELS
DIVISION 99-10 SPECIALTIES	
	99-10264 BULLET RESISTANT PANELS
	99-10445 SIGNS
	99-10522 FIRE EXTINGUISHERS
	99-10802 TOILET ROOM ACCESSORIES
DIVISION 99-11 EQUIPMENT	
	(Not Used)
DIVISION 99-12 FURNISHINGS	
	(Not Used)
DIVISION 99-13 SPECIAL CONSTRUCTION	
	99-133210 - MODULAR BUILDING
	99-133510 - PREFABRICATED MODULAR ACCESS SYSTEM
DIVISION 99-14 CONVEYING SYSTEMS)	
	(Not Used)

Section 99 Table of Contents (continued)

DIVISION 99-15 MECHANICAL	
	99-15050 MECHANICAL WORK
	99-15060 PIPE, FITTINGS, VALVES
DIVISION 99-16 ELECTRICAL	
	99-16010 ELECTRICAL WORK
	99-16050 BASIC MATERIALS AND METHODS
	99-16432 ELECTRICAL EQUIPMENT
	99-16520 CLOSED CIRCUIT TELEVISION SYSTEM
	99-16911 PUMP CONTROL SYSTEM

1.2 ABBREVIATIONS

- A. Interpret the meaning of an abbreviation as shown in the following table:

Abbreviations

Abbreviation	Meaning
AAMA	American Architectural Manufacturers' Association
ADAAG	ADA Accessibility Guidelines for Buildings and Facilities
AGA	American Gas Association
AITC	American Institute of Timber Construction
ALSC	American Lumber Standard Committee
AMCA	Air Movement and Control Association International
APA	Engineered Wood Association
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BIA	Brick Industry Association
CEC	California Electrical Code
CMC	California Mechanical Code
CPC	California Plumbing Code
CRRC	Cool Roof Rating Council
CSA	Canadian Standards Association
ESO	Electrical Safety Orders
FM	FM Global
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
IGMA	Insulating Glass Manufacturers Alliance
ISO	International Organization for Standardization
NAAMM	National Association of Architectural Metal Manufacturers
PEI	Porcelain Enamel Institute
RIS	Redwood Inspection Service
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
TCNA	Tile Council of North America
TPI	Truss Plate Institute
WCLB	Grade stamp issued by West Coast Lumber Inspection Bureau
WI	Woodwork Institute
WWPA	Western Wood Products Association

1.3 DEFINITIONS (Not Used)

1.4 COORDINATION WITH THE DEPARTMENT

- A. The Department will be working at or near the job site. Coordinate activities with the Department to avoid delays.
- B. Comply with security policies of the Department facility.

- C. Submit a request for authorization before interrupting any service for the purpose of making or breaking a connection. Include in the request the proposed time necessary to complete the work. Allow 5 days for the review of each request.
- D. You may obtain electrical power and water from existing Department electrical power and water outlets on the job site for Contract operations at no cost to you. The Engineer determines which outlets you may use. You must not modify outlets.
- E. Do not use Department telephones.

1.5 SUBMITTALS

- A. In addition to specified submittals, submit any other submittal the Engineer requests.
- B. Within 50 days of Contract approval, submit building construction work action submittals, including:
 - 1. Shop drawings
 - 2. Material lists
 - 3. Product and descriptive data
 - 4. Samples
- C. Submit at least 5 sets or samples for each item. Except for samples, the Department returns 2 copies that show an authorized date or a request for correction and resubmittal.
- D. Submit the schedule of values within 20 days of Contract approval. Submit at least 2 sets.
- E. Each shop drawing sheet must be at least 11 by 17 inches and at most 24 by 36 inches.
- F. Each material list must include the name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols described.
- G. Submit building construction work submittals electronically. Notify the Engineer of the submittal. Include the date and contents of the submittal in the notification. Prepare submittals as a PDF package, incorporating complete information into each PDF file with the submittal number in the PDF file name, and submit the package electronically.
 - 1. Email: Transmit PDF package by sending via email to sc.office.associates@dot.ca.gov. Include PDF transmittal form. Include submittal information in the email subject line. Each PDF e-mail attachment must not exceed 25 MB in size. The e-mail message must not exceed 50 MB in size.
 - 2. Web-Based Project Management Software: Upload PDF package to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- H. Allow 20 days for the review.
- I. Dispose of samples not incorporated in the work.
- J. Submit 3 copies of the following items as informational submittals:
 - 1. Part lists and service instructions packaged with or accompanying the equipment
 - 2. Operating and maintenance instructions
 - 3. Manufacturer's warranties
 - 4. Qualification data

1.6 QUALITY CONTROL AND ASSURANCE

- A. Regulatory Requirements: California Building Standards Code (California Code of Regulations Title 24).
- B. Codes can be found at <http://www.bsc.ca.gov/codes.aspx>
- C. For California Green Building Standards Code, California Code of Regulations Title 24, Part 11:
 - 1. Comply with the Tier 1 requirements of Appendix A5 "Nonresidential Voluntary Measures", in addition to all other requirements.
 - 2. Use the sample forms referenced in Section 5.408.1.4, "Documentation", to comply with the documentation requirements of Section 5.408, "Construction Waste Reduction, Disposal and Recycling."
 - 3. Prepare all verification of compliances required in Section 5.504, "Pollutant Control."

1.7 PRECONSTRUCTION CONFERENCE

- A. Discuss the requirements of the following documents at the preconstruction conference:
 - 1. California Energy Code, California Code of Regulations Title 24, Part 6.
 - 2. California Green Building Standards Code, California Code of Regulations Title 24, Part 11.

1.8 SCHEDULE OF VALUES

- A. Section 9-1.16B does not apply.
- B. Divide the schedule of values into sections representing the cost of each separate building or structure. Do not include work that is not part of the building or structure, such as excavation, grading, curbs, gutters, sidewalks, paving, sewer and storm drainage, or utility distribution lines, in the building or structure cost. Include this work in a section titled "General Work."
- C. List indirect costs and bond premiums as separate line items of work.
- D. Identify the sections representing each building or structure as to the building or structure they represent and break them down to show the corresponding value of each craft, trade, or other significant portion of the work. Provide a subtotal for each section.
- E. Obtain authorization of a schedule of values before you perform work shown on the schedule. The Department does not process a progress payment for building work without an authorized schedule of values.
- F. The sum of the items listed in the schedule of values must equal the contract lump sum price for building work. Do not list overhead and profit. Include bond premiums and other such items in the mobilization bid item for the entire project.

1.9 UTILITY CONNECTIONS

- A. Make arrangements and obtain PLACs required for the extension of and connection to each utility service. For extensions not furnished by the utility, furnish the extensions and install any intermediate equipment required by the serving utilities.
- B. The costs incurred by you for the following items is change order work:
 - 1. Utility permits, licenses, connection charges, and excess length charges
 - 2. Extensions of utilities beyond the limits shown
 - 3. Furnishing and installing any intermediate equipment required by the serving utilities

1.10 SANITARY FACILITIES

- A. During toilet room renovation or other periods when Department sanitary facilities are not operational, furnish the following for Department forces:
 - 1. Wash facilities
 - 2. Drinking water fixtures
 - 3. At least 1 temporary toilet units
- B. Furnish separate temporary toilet units for your personnel.
- C. Temporary toilet units must be (1) single-occupant units of the chemical type, (2) properly vented, and (3) fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- D. Perform periodic flushing, waste removal, and cleaning of temporary toilet units. Maintain units in a clean and sanitary condition, including a supply of toilet paper, toilet seat covers, and paper towels.

1.11 AS-BUILT DRAWINGS

- A. Prepare and maintain 1 set of as-built drawings using an unaltered set of original project plans, to show all as-constructed information, including:
 - 1. Any plan clarifications or *Change Order* changes
 - 2. Locations of any underground utilities
 - 3. Location, size, type, and manufacturer of major products or components used in the work
- B. Neatly prepare as-built drawings as follows:
 - 1. Place markings on the project record drawings using red ink or red pencil.
 - 2. Do not eradicate or write over original figures.
 - 3. Line out superseded material.
 - 4. Submit additional drawings if the required information cannot be clearly shown on the original set of project plans. The additional drawings must be at least 11 by 17 inches and at most 24 by 36 inches.
 - 5. Sign and date each sheet verifying that all as-built information shown on the drawings is correct.
- C. Review the as-built drawings monthly with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

- D. Before completion of the work, request a review of the as-built drawings to determine the completeness and adequacy of them. If the as-built drawings are unacceptable, you must inspect, measure, and survey the work as necessary to record the required additional information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

1.1 INSPECTION

- A. Any work that will be covered or not visible in the completed work must be inspected and accepted by the Engineer before progress of work conceals portions to be inspected. Notify the Engineer at least 3 business days before needing inspection.

END OF SECTION 99-010000

99-01050 FIELD ENGINEERING

99-01050A General

99-01050A(1) Summary

This work includes administrative and procedural requirements for field engineering services to be performed by you.

99-01050A(2) Definitions

Not Used

99-01050A(3) Submittals

Not Used

99-01050A(4) Quality Control and Assurance

Lines and Grades:

Such stakes or marks will be set by the Department as determined by the Engineer to be necessary to establish the lines and grades required for the completion of the work shown and as described. In general, these will consist of the primary vertical and horizontal control points.

Carefully preserve stakes and marks set by the Department. In case such stakes and marks are destroyed or damaged, they will be replaced at the Department's earliest convenience. You will be charged for the cost of necessary replacement or restoration of such stakes and marks which in the judgment of the Engineer were carelessly or willfully destroyed or damaged by your operations. This charge will be deducted from any moneys due or to become due to you.

All other stakes or marks required to establish the lines and grades required for the completion of the work will be your responsibility.

Existing Utilities and Equipment:

The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, you must investigate and verify the existence and location of underground utilities and other construction.

Prior to construction, you must verify the location and invert elevation at points of connection of sanitary and septic sewers, storm sewer, and water or fire service piping.

99-01050B Materials

Not Used

99-01050C Construction

Surveys for Layout and Performance:

You must perform all surveys for layout and performance, reduce field notes, and make all necessary calculations and drawings necessary to carry out the work.

You must locate and layout site improvements, and other work requiring field engineering services, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

Batter boards must be located and laid out for structures, building foundations, column grids and locations, floor levels and, control lines and levels required for mechanical and electrical work.

Survey Accuracy and Tolerances:

The tolerances generally applicable in setting survey stakes for foundations, slabs, and underground work must not exceed the following:

Survey Stakes or Markers	Tolerance
Rough grading or excavation	0.10-foot
Trimming or preparation of subgrade for roadways	0.05-foot
Roadway surfacing, steel or concrete pipe	0.02-foot
Structures or building construction	0.01-foot

Such tolerance must not supersede stricter tolerances required by the plans or special provisions, and must not otherwise relieve you of responsibility for measurements in compliance therein.

99-01050D Payment

Not Used

99-2 SITEWORK

99-02071 REMOVING PORTIONS OF EXISTING FACILITIES

99-02071A General

99-02071A(1) Summary

Scope: This work consists of removing portions of the existing facilities, including removal of existing work to gain access to or for new work.

99-02071A(2) Definitions

Not Used

99-02071A(3) Submittals

Not Used

99-02071A(4) Quality Control and Assurance

Not Used

99-02071B Materials

Not Used

99-02071C Construction

99-02071C(1) Preparation

The limits of removal must be located and identified. Items to be removed and the interface of items to be removed and items to remain intact must be identified and marked.

Prior to removing concrete, a saw cut approximately one inch deep must be made along the limits of removal on all faces that will be visible in the completed work.

99-02071C(2) Removal

Removal must be to the limits shown. Removal must be done carefully to minimize damage to the portions to remain. Remaining portions that are damaged by your operation must be restored to original condition at your expense.

Assemblies to be salvaged which require dismantling for removal must be matchmarked before dismantling.

Existing apparatuses, devices, or accessories which would be functionally impaired by new construction or remodeling must be moved, brought out to new surfaces, or provided with new access covers, as necessary to restore apparatuses, devices, or accessories to their original usefulness.

Piping and conduits to be abandoned must be capped or plugged.

Surfaces that are exposed to view at the limits of removal work must be patched, bumps must be removed and depressions filled, and the surface must be finished to match the existing surrounding surfaces. Depressions in concrete less than one inch deep must be deepened to one inch minimum depth before filling with cement mortar.

99-02071C(3) Disposal

Materials that are to be removed must be handled under section 14-10.

99-02071C(4) Salvage

Materials or equipment shown to be salvaged for use by the Department must remain the property of the State and must be removed, cleaned, and stockpiled at a location at the job site designated by the Engineer.

99-02071D Payment

Not Used

99-02220 EARTHWORK FOR BUILDING WORK

99-02220A General

99-02220A(1) Summary

Scope: This work consists of performing earthwork for building work.

Earthwork for building work consists of structure excavation and structure backfill. Structure excavation includes excavation for footings, foundations, walls, slabs, and trenches. Structure backfill includes backfilling under slabs; backfilling under and around footings; backfilling for pipes and conduits; backfilling holes resulting from removal of existing facilities. In addition to structure excavation and structure backfill, earthwork for building work includes any other earthwork, not mentioned, but necessary to complete the building work.

99-02220A(2) Definitions

Not Used

99-02220A(3) Submittals

Samples: Submit samples of sand, pea gravel, or crushed stone, weighing not less than 25 pounds.

99-02220A(4) Quality Control and Assurance

Not Used.

99-02220A(5) Site Conditions

Existing Underground Piping and Conduit: The location of existing underground piping and conduit is based on the best records available. Before beginning work, you must accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown by more than 5 feet, or, if no elevations are indicated and the piping or conduit is more than 3 feet below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be change order work.

Existing Surfaced or Planted Areas:

Existing surfaced or planted areas that are removed, broken, or damaged by your operations must be restored to their original condition except as otherwise shown or described.

Restoration materials must be equal to or better than the original materials. Surfacing must be replaced to match the material thickness, grades, and finish of the adjacent surrounding surfaces.

99-02220B Materials

Structure Backfill: Structure and trench backfill must be free of organic and other deleterious material and must be suitable for the required compaction. Gravel without sand matrix must not be used except as free draining granular material beneath slabs and footings.

Sand: Sand must be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 1/4-inch sieve, 90 percent to 100 percent passes the No. 4 sieve and not more than 5 percent passes the No. 200 sieve size.

Pea Gravel (Naturally Rounded):

Pea gravel (naturally rounded) must be clean, washed, dry density of not less than 95 pounds per cubic foot, free from clay or organic material and must comply with the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
3/4"	100
1/2"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-3

Pea gravel must comply with the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

Crushed Stone:

Crushed stone must be clean, washed, dry density of not less than 95 pounds per cubic foot, crushed stone or crushed gravel with an angular particle size not less than 1/8 inch or more than 1/2 inch.

Sieve or Screen Size	Percentage Passing
1/2"	100
3/8"	85-100
No. 4	10-30
No. 8	0-3

Crushed stone must comply with the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

99-02220C Construction

99-02220C(1) Preparation and Restoration

Sawcutting: Prior to excavation or trenching, existing surfacing must be removed to saw cut lines, or to existing wood dividers or expansion joints, if any. The saw cut must be to a neat line and have a depth not less than one inch.

Restoration: Surfacing must be replaced to match the thickness, grades and finish of the adjacent surrounding surfaces.

99-02220C(2) Structure Excavation

Unless otherwise noted, all excavation for building work is classified as structure excavation.

Footing Excavation:

The bottom of excavation must not be disturbed. You must excavate by hand to the final grade. The bottom of concrete footings must be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown must be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths must not be disturbed. Unsuitable material must be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown, when such excavation has been ordered by the Engineer, will be change order work.

Excavate to the elevations and dimensions within a tolerance of $\pm 1/2$ inch. Limits of the excavation must allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation must be replaced in kind and compacted at your expense.

Overdepth excavation for footings must be backfilled with concrete or such other material recommended by you and authorized by the Engineer. Relative compaction must be not less than 95 percent.

At locations and to the limits shown, material below the bottom of the foundation or footing must be removed and replaced with select backfill under the placing and compacting requirements for backfill.

Excavation for Pipes and Conduits:

Pipes or conduits in the same trench must have a minimum clear distance between pipes or conduits of 6 inches. Pipes or conduits must have not less than 2½ feet of cover from top of pipes or conduits to finished grade unless otherwise shown or described.

Trenching must be of sufficient depth to permit placing a minimum depth of 4 inches of compacted sand under all pipes and conduits.

Excavation adjacent to trees must be performed by hand methods where necessary to avoid injury to trees and roots. Roots 2 inches in diameter and larger must be protected with heavy burlap. Roots smaller than 2 inches in diameter adjacent to trees must be hand trimmed. Cuts through roots 1/2 inch in diameter and larger must be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree must be shaded with burlap and kept damp. Materials must not be stockpiled within the drip line of trees.

Dewatering: Excavations must be kept clear of standing water. Water must be removed by pumping if necessary. Water removed from excavation must be carried away from the building site and disposed of.

99-02220C(3) Structure Backfilling

Unless otherwise noted, all backfill for building work must be classified as structure backfill. Backfill must be placed and compacted in horizontal layers, not more than 6 inches thick prior to compaction, and to the lines and grades shown or to original ground.

Structure Backfill: After structures are in place and forms are removed, wood and other debris must be removed from excavations before placing structure backfill.

Backfilling Pipes and Conduits:

Backfill placed under pipe and conduits must be compacted sand, 4 inches minimum depth. Backfill material placed to a level 6 inches above tops of pipes and conduits must be sand or fine earth and particles must not exceed 1/2 inch in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand must be used for backfill. Backfill material placed higher than 6 inches above tops of pipes or conduits must consist of material free of stones or lumps exceeding 4 inches in greatest dimension except:

1. The top 12 inches of backfill under roads, walks or paving must consist of aggregate base material.
2. The top 6 inches of backfill in planted areas must consist of topsoil.

Unless otherwise shown, pipe under roads, with less than 2½ feet of cover over the top of pipe, must be backfilled with concrete to a level 4 inches above the top of pipe. Concrete for backfill must be commercial quality concrete containing not less than 590 pounds of cement per cubic yard.

99-02220C(4) Compaction

Relative compaction must be determined under California Test 216 or 231.

Unless otherwise noted below, all backfill must be compacted to a minimum relative compaction of 90 percent.

Unless authorized, compaction by jetting or ponding will not be permitted.

Compact Original Ground: Original ground surface under fill with surfacing of concrete and asphalt concrete must be compacted to a relative compaction of not less than 95 percent for a minimum depth of 6 inches.

Subgrade Preparation:

Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon must include fine grading, compaction, reworking as necessary. The upper 6 inches of the subgrade must have the same compaction as the fill to be placed over it.

The prism of backfill directly underneath the building foundation and sloping downward at 1:1 must be compacted to 95 percent.

Structure Backfill: Structure backfill must be compacted to not less than 95 percent relative compaction.

Trench Backfill: Trench backfill placed beneath slabs or paved areas must be compacted to a relative compaction of not less than 95 percent.

99-02220C(5) Disposal

Surplus Material: Surplus material from the excavation must be removed and disposed of.

99-02220C(6) Field Quality Assurance

Inspection: When the excavation is substantially completed to grade, you must notify the Engineer. No concrete must be placed until the foundation has been authorized by the Engineer.

Testing: The Department will conduct compaction tests during the backfilling and compacting operations.

99-02220D Payment

Not Used

99-02236 FREE DRAINING GRANULAR MATERIAL

99-02236A General

99-02236A(1) Summary

Scope: This work consists of furnishing and placing free draining granular material beneath slabs.

99-02236A(2) Definitions

Not Used

99-02236A(3) Submittals

Not Used.

99-02236A(4) Quality Control and Assurance

Not Used.

99-02236B Materials

Free Draining Granular Material: Free draining granular material must be clean, hard, durable, free-draining rock. The material gradation must be such that all passes the one-inch screen, and not more than 10 percent passes the No. 4 sieve as determined by California Test 202. Granular material must be free from organic material, clay balls, or other deleterious substances.

99-02236C Construction

Free draining granular material must be placed, spread, and consolidated by tamping or vibrating.

99-02236D Payment

Not Used

99-02585 PAINTED PAVEMENT MARKINGS

99-02585A General

99-02585A(1) Summary

Scope: This work consists of applying paint, temporary striping, and pavement marking tape for pavement markings.

Pavement markings include word and symbol markings, and parking stall markings.

99-02585A(2) Definitions

Not Used

99-02585A(3) Submittals

Not Used

99-02585A(4) Quality Control and Assurance

Not Used

99-02585B Materials

Paint:

Paint must be commercial quality for pavement marking, formulated for the use intended, and manufactured by a nationally recognized manufacturer of coating products.

Traffic paint must comply with the rules for control of volatile organic compound (VOC) emissions adopted by the South Coast Air Quality Management District (SCAQMD)-.

99-02585C Construction

Alignment and Layout:

All necessary alignment and layout work must be performed by you, in a manner that will not damage the pavement.

Unless otherwise shown, the width of parking stall markings must be 4 inches.

Equipment and Operation:

Mechanical means must be used to paint pavement markings.

All equipment used in the application of paint must produce pavement markings of uniform quality.

All spray equipment must be the proper type and of adequate capacity for the work involved.

Air atomized spray equipment must be equipped with oil and water extractors and pressure regulators, and must have adequate air volume and compressor recovery capacity. Spray gun tip needle assemblies and orifices must be the proper size.

Stencils and hand spray equipment must be used to paint word and symbol markings. Stencils must be furnished by you. The stencil layout must comply with the dimensions shown.

Surface Preparation: Surfaces to receive paint must be cleaned of all dirt and loose material.

Application:

Paint must be applied only on dry surfaces, and only during periods of favorable weather, under the manufacturer's instructions.

On new surfacing, paint must be applied in 2 coats. The first coat must be dry before application of the second coat is applied.

On existing surfacing, paint must be applied in one coat.

Completed pavement markings must have clean and well-defined edges, and must comply with the dimensions shown or as described.

Drips, oversprays, improper markings, and paint material tracked by traffic must be immediately removed from the pavement by methods authorized by the Engineer. All such removal will be at your expense.

Application Rates: Each application of paint must be applied at the rates recommended by the paint manufacturer for the type of surface involved.

Protection: Newly placed pavement markings must be protected from damage by traffic or other causes until the paint is thoroughly dry.

Disabled Accessible Parking Stall Symbol: Each parking space reserved for persons with physical disabilities must have a minimum 3' x 3' surface identification with the international symbol of accessibility. The symbol and border must be white and the background must be blue complying with SAE AMS-STD-595, Color No. 15090.

99-02585D Payment

Not Used

99-02842 GUARD POSTS

99-02842A General

99-02842A(1) Summary

Scope: This work consists of constructing guard posts.

99-02842A(2) Definitions

Not Used

99-02842A(3) Submittals

Not Used.

99-02842A(4) Quality Control and Assurance

Not Used.

99-02842B Materials

Steel Posts: Steel posts for guard posts must comply with ASTM A 53/A 53M, Grade B, standard weight, galvanized steel pipe complying with the details shown.

Concrete: Concrete for guard posts must be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 505 pounds of cement per cubic yard.

99-02842C Construction

Installation:

The length and diameter of the guard posts must comply with the details shown.

Guard posts must be placed in holes excavated to the depth and cross section shown and must be installed plumb.

Excavations for guard posts must be backfilled with concrete as shown. Guard posts must be filled with concrete.

Painting: Guard posts must be prepared and painted under section 99-09900.

99-02842D Payment

Not Used

99-02846 ACCESSIBLE AND UNAUTHORIZED PARKING SIGNS

99-02846A General

99-02846A(1) Summary

Scope: This work consists of installing accessible and unauthorized parking signs.

99-02846A(2) Definitions

Not Used

99-02846A(3) Submittals

Product Data: Manufacturer's descriptive data for sign materials, colors, graphics, and sign fastening details must be submitted.

Certificate of Compliance: Submit a certificate of compliance for the sheet aluminum.

99-02846A(4) Quality Control and Assurance

Regulatory Requirements: Accessible parking signs must comply with the requirements in 24 CA Code of Regs Pt 2, CBC §§ 11B-502.6 "Identification", §§ 11B-502.8 "Additional Signs", and CA Veh Code Division 11, Chapter 9 "Stopping, Standing, and Parking."

99-02846B Materials

Sign Colors: The color white must comply with the requirements in AMS STANDARD 595 Color, Federal Standard 17875. The color blue must comply with the requirements in AMS STANDARD 595 Color, Federal Standard 15090.

Signs:

Single sheet aluminum signs must be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38, not less than 0.063-inch thick (14-gauge) with rounded corners. Alloy and temper designations for sheet aluminum must comply with the requirements in ASTM B 209.

Sheet aluminum must be cleaned and pretreated under ASTM B 449, Class 2.

You must furnish Type III retroreflective sheeting under ASTM D 4956. The adhesive backing must be pressure sensitive and fungus resistant. Retroreflective sheeting must be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, or damage.

A protective overlay film of the type, kind, and product that is approved by the manufacturer of the retroreflective sheeting must be applied. Protective overlay film must be premium quality.

The face of each finished sign must 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 must be free of router chatter marks, burns, sharp edges, delaminated skins, excessive adhesive over spray and aluminum marks.

Signs must be protected by thorough wrapping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Padding and protective materials must be placed between signs as appropriate. Finished sign panels must be transported and stored by method that protects the face of signs from damage. You must replace wet, damaged, or defective signs.

Sign Post: Sign post must be commercial quality, standard weight, galvanized steel pipe complying with the requirements in ASTM F 1083. Post must be supplied with galvanized steel post top.

Fastening Hardware: Fastening hardware must be galvanized or cadmium plated.

Concrete: Concrete for sign posts must be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 505 pounds of cement per cubic yard.

99-02846C Construction

Sign posts must be set vertically in concrete, in holes excavated to the depth and cross-section shown.

Signs must be fastened rigidly and securely to the sign post.

99-02846D Payment

Not Used

99-3 CONCRETE AND REINFORCEMENT

99-03300 CAST-IN-PLACE CONCRETE

99-03300A General

99-03300A(1) Summary

Scope: This work consists of constructing cast-in-place concrete facilities.

Concrete:

Except for concrete used for minor work, concrete must comply with section 90. The minimum required compressive strength must be as described or 3,600 psi at 28 days, whichever is greater.

Concrete for minor work must comply with section 90-2.

Reinforcement: Reinforcement must comply with section 52, except you may use deformed bars complying with ASTM A 615/A 615M, Grade 60.

99-03300A(2) Definitions

Not Used

99-03300A(3) Submittals

Product Data:

Manufacturer's descriptive data, installation and use instructions for admixtures, expansion joint material, vapor barrier, curing compound, hardener, and sealer must be submitted.

Descriptive data must be delivered to the Engineer at the job site.

Concrete Mix Designs: Submit copies of concrete mix designs.

Certificates of Compliance: Submit a certificate of compliance when required.

99-03300A(4) Quality Control and Assurance

Not Used.

99-03300B Materials

99-03300B(1) Concrete Mixes

The amount of cementitious material used per cubic yard of concrete for each building element must comply with the following:

Type	Cementitious Material Content (Pounds/CY)
Concrete (Structural Work): Footings, foundation walls, floor slabs, building frame members, building walls	590 min. ^a
Concrete (Sewer Structures): For sewer structures, vehicle washracks and mudrinse slabs	658 min. ^b
Concrete (Minor Work): For concrete curbs, sidewalks, driveways, gutter depressions, new door openings, and collars	505 min.

Notes:

^aFor concrete designated by compressive strength, the maximum amount of cementitious material must be 800 pounds per cubic yard.

^bConcrete must be air entrained under section 90-1.02E. The air content at time of mixing and prior to placing must be $6 \pm 1\frac{1}{2}$ percent.

99-03300B(3) Form Materials

Forms for Exposed Finish Concrete:

Forms for exposed surfaces must be plywood, metal or other panel type materials. Plywood must be not less than 5/8 inch thick and without scars, dents, and delaminations. Forms must be furnished in largest practical pieces to minimize number of joints.

Plywood must comply with the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs must be nominal 2-inch solid stock lumber, plywood, or metal forms.

Forms for Unexposed Finish Concrete: Forms for unexposed finish concrete surfaces must be plywood, lumber, metal, or other acceptable material.

Forms for Cylindrical Columns or Supports: Forms for cylindrical columns must be metal, fiberglass reinforced plastic, paper, or fiber tubes. Paper or fiber tubes must be constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for protection against weather or moisture.

Form Ties: Form ties must be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form Oil: Form oil must be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

99-03300B(4) Reinforcement

Not Used

99-03300B(5) Epoxy

Epoxy must be furnished as 2 components which must be mixed together at the site of the work.

Epoxy Resin Adhesive: Epoxy resin adhesive must comply with State of California Specification No. 8040-21M-08 or other epoxy suitable for bonding new concrete to old.

Epoxy Mortars: Epoxy mortar and epoxy mortar surface treatment must consist of a commercial quality, trowelable mixture consisting of epoxy and sand. Epoxy must have a pull-off strength of not less than 1,000 psi and a 90-percent cure in 24 hours. Epoxy must be of the type that requires no primer as a bonding agent.

Sand:

Sand for use in epoxy mortars must be clean and must have a moisture content of not more than 0.50-percent when tested under California Test 226.

Sand for epoxy mortar surface treatment must be graded such that 100-percent passes the No. 100 sieve.

99-03300B(6) Related Materials

Anchor Bolts and Anchor Rods, Nuts and Washers:

Headed and Unheaded Anchor Bolts and Anchor Rods: Comply with ASTM F 1554. Use Grade 36 unless a higher grade is shown.

Nuts: Comply with ASTM A 563.

Washers:

1. Washers bearing on wood surfaces must be commercial quality.
2. Washers bearing on steel surfaces must comply with ASTM F 436, Type 1.
3. Plate washers must comply with ASTM A 36/A 36M.

Exposed anchor bolts and anchor rods, nuts and washers must be hot-dipped galvanized.

Expansion Joint Material: Expansion joint material must be commercial quality asphalt impregnated pressed fiber sheets, ½-inch minimum thickness.

Vapor Barrier: Vapor barrier must be not less than 15 mils thick and must comply with the requirements of ASTM E 1745, Grade A. Tape for overlapped seams must be as recommended by the manufacturer of the vapor barrier.

Bond Breaker: Bond breaker must be Type I asphalt saturated organic felt or such other material authorized by the Engineer.

Nonskid Abrasive Aggregate: Nonskid abrasive aggregate must be commercial quality aluminum oxide, silicon carbide, or almandite garnet grit particles; screen size 12-30 or 14-36.

Type A Control Joints: Type A control joints must be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed Construction Joint Forms: Keyed construction joint forms must be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms must produce a rabbeted key type joint.

Divider and Edger Strips: Divider and edger strips must be foundation grade redwood.

Mortar: Mortar must consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing Compound: Curing compound must be curing compound no. 6.

Concrete Hardener: Concrete hardener must be commercial quality water borne penetrating type magnesium fluosilicate, zinc fluosilicate or combination thereof.

Splash Block: Splash blocks must be precast concrete splash blocks with depressed runoff trough. Splash blocks must be 12" x 24" x 3½" in size unless otherwise shown.

Nonsrink Grout:

Nonshrink grout must be metallic for concealed areas, nonmetallic for exposed areas.

Grout must be factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; free of oxidizing catalysts and inorganic accelerators, used as dry or damp pack, or mixed to a 20-second flow (CRD C621), without segregation or bleeding at any temperature between 45 deg F and 90 deg F.

Working time of grout must be 30 minutes or more.

99-03300C Construction

99-03300C(1) Preparation

Existing Concrete Construction:

Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material must be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface must be no smoother than a wood trowelled surface. Cleaning of the contact surfaces must remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods must be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete must be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms:

Forms must be mortar tight, true to the dimensions, lines, and grades shown, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces must be constructed with triangular fillets not less than 3/4" x 3/4" attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners must be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties must be removed to a depth of at least one inch below the surface of the concrete.

The inside surfaces of forms must be cleaned of all dirt, mortar and foreign material. Forms must be thoroughly coated with form oil prior to use.

Forms must not be stripped until at least 40 hours after placing concrete, except soffit forms and supports must not be released or removed until at least 10 days after placing concrete.

Anchorage and embedded items must be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing must be installed on concrete forms before the concrete is placed.

Redwood dividers must have 16d galvanized nails partially driven into both vertical faces at 18 inches on center.

Vapor Barrier:

Vapor barrier must be installed under the manufacturer's instructions and must be protected with a 3-inch layer of clean uncompacted sand cover.

Unless otherwise shown, vapor barrier must be placed under portions of the floor slab scheduled to receive finish flooring.

Placing Reinforcement:

If authorized, you may use plastic supports to hold reinforcement in position.

Set wire ties with ends directed into concrete, away from exposed concrete surfaces.

Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

Ground Bar: A continuous reinforcing steel bar must be installed in the building foundation at the location shown for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar must extend beyond the concrete surface and must be protected from damage by construction operations.

99-03300C(2) Placing Concrete

Concrete must be placed under section 51-1.03D.

Concrete must be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete must be placed in alternate long strips between construction joints and the final slab infilled.

99-03300C(3) Colored Concrete

Not Used

99-03300C(4) Finishing Concrete Surfaces

Finishing Unformed Surfaces:

Slabs must be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds must be set to grade at approximately 6-foot centers. After leveling, screeds must be removed and the surface must be floated with wooden floats.

Type A control joint strips must be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips must be standard manufactured lengths and must be placed on an approximate straight line. The top flange of the strips must be removed after the concrete has set and cured.

The floated surface must be trowelled with steel trowels. Troweling must form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic must be given a non-slip broom finish unless a different finish is described.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile must be floated to grade and then, before final set of the concrete, the floated surfaces must be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs must not deviate more than 1/8 inch from the lower edge of a 10-foot long straight edge.

Finishing Formed Surfaces:

Formed concrete surfaces must be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view must have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance must be sanded with power sanders or other authorized abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete must closely match the color of surrounding surfaces.

Nonskid Abrasive Aggregate Finish: Where shown, walkways must receive a nonskid abrasive aggregate (grit) finish. The grit must be applied uniformly at the rate of not less than 0.3 pound per square foot and

tamped into the floated concrete surface while the concrete is plastic. The grit must be buried about 0.7 diameter of each particle into the concrete.

99-03300C(5) Curing Concrete

Freshly placed concrete must be protected from premature drying and excessive cold or hot temperatures.

Floor slabs must be cured by the water method as specified for structures. Initial curing of floor slabs must start as soon as free water has disappeared from the concrete surface.

Concrete surfaces, other than floor slabs, must be cured by the forms-in-place method or the water method as specified for structures.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured by the curing compound method.

99-03300C(6) Protecting Concrete

Vehicles, equipment, or concentrated loads weighing more than 300 pounds individually and material stockpiles weighing more than 50 pounds per square foot will not be permitted on the concrete within 10 calendar days after placing.

99-03300C(7) Special Treatments

Concrete Hardener:

Chemical concrete hardener must be applied to the floor surfaces shown, prior to the application of concrete sealer. Surfaces must be clean and dry before the application of hardener.

The solution must be applied under the manufacturer's instructions.

After the hardener has dried, the surface must be mopped with water to remove encrusted salts.

Concrete Sealer: Concrete sealer must be applied to the concrete surfaces designated on the plans under the manufacturer's instructions for heavy duty use. The sealer must be applied to dry concrete surfaces.

Epoxy Resin Adhesive: Epoxy resin adhesive must be applied to concrete surfaces shown. Epoxy resin adhesive must be mixed and applied under the manufacturer's instructions.

Epoxy Mortars:

Epoxy for use as a binder in epoxy mortars must be thoroughly mixed together before the aggregate is added, and unless otherwise specified, the mix proportions must consist of one part binder to approximately 4 parts of aggregate, by volume.

All surfaces against which epoxy mortars are to be applied must be free of rust, paint, grease, asphalt, and loose or deleterious material.

99-03300D Payment

Not Used

99-4 MASONRY (Not Used)

99-5 METALS (Not Used)

99-6 WOOD AND PLASTICS (Not Used)

99-7 THERMAL AND MOISTURE PROTECTION

99-07920 SEALANTS

99-07920A General

99-07920A(1) Summary

Scope: This work consists of applying sealants which are required for this project, but not described elsewhere.

Related Work: Pourable polyurethane joint sealant for joints in concrete decks must comply with "Joint Sealant."

99-07920A(2) Definitions

Not Used

99-07920A(3) Submittals

Product Data: Manufacturer's descriptive data and installation instructions for all sealants must be submitted.

Samples: Color samples of all sealants must be submitted. Unless otherwise shown, colors will be selected by the Engineer from the manufacturer's standard colors.

Compatibility and Adhesion Test Reports:

Submit evidence that materials forming joint substrates and joint sealant backings have been tested for compatibility with and adhesion to joint sealants.

Submit interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

Certificates of Compliance: Submit a certificates of compliance for the sealants.

99-07920A(4) Quality Control and Assurance

Preconstruction Field Adhesion Testing: Before installing sealants, field test adhesion to joint substrates:

Locate test joints where indicated by Engineer.

Conduct field tests for each type of sealant and joint substrate. Test method: Hand pull method under the sealant manufacturer's instructions.

99-07920B Materials

All sealants, primers and accessories must be non-staining to adjacent exposed surfaces. Products having similar applications and usage must be of the same type and same manufacturer. Gun consistency compound must be used unless otherwise required by the job conditions.

Nonstaining: Products that have undergone testing under ASTM C 1248 or ASTM C 510 and have not stained porous substrates.

Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates under conditions of service and application as demonstrated by sealant manufacturer based on testing and field experience.

Acrylic Sealant: Acrylic sealant must be one compound, solvent release acrylic sealant.

Polyurethane Sealant: Multicomponent, nonsag, capable of 50 percent extension and contraction without failure, complying with ASTM C 920. Provide BASF, Sika, Tremco, or equal.

Butyl Sealant: Butyl sealant must be single-component, solvent-release, polyisobutylene sealant complying with ASTM C 1311.

Silicone Sealant: Silicone sealant must be one component, low modulus, non-acid curing building sealant complying with ASTM C 920 and formulated for reduced dirt pickup. Sealant must be tack-free in one hour, must not sag or flow, must be ozone resistant and capable of 100 percent extension and 50 percent contraction without failure. Provide BASF Sonneborn Sonolastic 150, Dow Corning 756 SMS Building Sealant, GE Silicones SilPruf NB SCS 9000, or equal.

Mildew Resistant Silicone Sealant: One component, sanitary type, mildew resistant, formulated with fungicide, intended for damp areas and complying with ASTM C 920. Provide Pecora 898, GE Sealants SCS 1700, Dow Corning 786, or equal.

Acoustical Sealant: Single component, latex, ASTM C 834, nondrying, nonhardening, nonsag, nonstaining, acoustically tested under ASTM E 90, paintable by acrylic or alkyd paints. Provide USG Sheetrock, Pecora AC-20, Owens Corning QuietZone, or equal.

Polysulfide Sealant: Polysulfide sealant must be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer Rod: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type B (consisting of both open- and closed-cell material) as recommended by manufacturer for application, of size and density to control sealant depth; polyurethane or polyethylene as recommended by sealant manufacturer. Backer rod must be sized such that it must be compressed between 25 percent and 75 percent of its uncompressed diameter during installation in the joint.

Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint.

Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated under anticipated service conditions, as determined from preconstruction joint sealant substrate tests and field tests.

Neoprene: Neoprene must comply with the requirements of ASTM C 542.

99-07920C Construction

Unless otherwise shown, sealants must be applied under the manufacturer's instructions and ASTM C 1193.

When silicone sealants (or mildew-resistant silicone sealants) are used in locations where painting is required, use sealants formulated to accept paint satisfactorily and demonstrated to do so in preconstruction mockups, or sealants tinted to match adjoining painted surfaces.

Sealants must be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant must be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant must remain undisturbed for not less than 48 hours.

99-07920D Payment

Not Used

99-8 DOORS AND WINDOWS

99-08710 DOOR HARDWARE

99-08710A General

99-08710A(1) Summary

Scope: This work consists of installing mechanical door hardware for swinging doors.

99-08710A(2) Design Requirements

Hardware must be free of defects, blemishes, and excessive play. Obtain each kind of hardware from 1 manufacturer for (1) latch and locksets, (2) exit devices, or (3) hinges and closers.

Furnish hardware items required to complete the work complying with performance level and design intent. Comply with the manufacturers' instructions for installation.

Furnish the manufacturer's updated item where specified item is now obsolete.

Furnish hardware with suitable fasteners to complete work.

Furnish ANSI/BHMA A156 Operational Grade 1 and Security Grade 1 for door hardware unless otherwise specified.

Maintenance Tools: Furnish a complete set of specialized tools for continued adjustment, maintenance, removal, and replacement of door hardware.

99-08710A(3) Definitions

BHMA: Builders Hardware Manufacturers Association.

NRP: Non-removable pin.

SFIC: Small format interchangeable core.

SFM: CA State Fire Marshal.

99-08710A(4) Submittals

Product Data: Submit for all products. Include the following:

1. Manufacturer's technical information and catalog cuts for each door hardware item. Include style, function or type, grades, size, and finish.
2. Fasteners and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. ANSI/BHMA certification.
5. SFM listing and UL approval where specified.
6. Installation details for door hardware.

Shop Drawings:

Submit locations of door hardware sets, cross-referenced to drawings, both on floor plans and in door schedule. Include identification number, location, hand, and material of each door and frame.

Door Hardware Schedule: Submit door hardware sets with all items required for each door. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, style, thickness, hand, function, and finish of door hardware.

Closeout Documents:

Include closeout documents in the "Maintenance and Operations Manual" before completion of the work. Submit 1 copy of PDF files on USB drive.

Closeout documents must include the following:

1. Index.
2. Parts list.
3. Operating instructions.
4. Maintenance instructions.

Incomplete or inadequate documentation will be returned for correction and resubmittal.

99-08710A(5) Quality Control and Assurance

99-08710A(5)(a) General

Floor Stops must comply with California Access Compliance Reference Manual Policy No. 99-08, *Door Stops and Other Floor-Mounted Obstructions*.

99-08710A(5)(b) Regulatory Requirements

Door hardware and installation must comply with 24 CA Code of Regs Pt 2 and the following table:

Door hardware item	ANSI/BHMA Standard
Full mortise hinges	ANSI/BHMA A156.1
Cylindrical locksets	ANSI/BHMA A156.2
Door closers	ANSI/BHMA A156.4
Lock cylinders, single cylinder deadbolts and electric strikes	ANSI/BHMA A156.5
Push plates, pull plates, kick plates, and mop plates	ANSI/BHMA A156.6
Mortise locksets	ANSI/BHMA A156.13
Manual flush bolts, floor stops, wall stops, door stops, and wall bumpers	ANSI/BHMA A156.16
Materials and finishes	ANSI/BHMA A156.18
Thresholds	ANSI/BHMA A156.21
Door gasketing, automatic door bottoms, door shoes with rain drip, door sweeps, door top weatherstrips, and overhead door drips	ANSI/BHMA A156.22
Keying systems	ANSI/BHMA A156.28
Hardware preparation in steel doors and steel frames	ANSI/BHMA A156.115

99-08710B Materials**99-08710B(1) General**

Furnish door hardware sets for each door as described.

Exit doors must be operable from the inside at all times with single motion and without the use of a key, special knowledge, or effort.

Plans show direction of swing or hand of each door leaf. Furnish each item of hardware for proper door movement.

99-08710B(2) Hinges

Hinges must be full mortise, five knuckle, ball bearing construction and comply with the following:

1. Heavy Weight Hinges:
 - 1.1. Interior: Type 8111
 - 1.2. Exterior: Type 5111, use NRP with set screw on out swinging exterior doors
2. Standard Weight Hinges: Type A8112

99-08710B(3) Mechanical Locks and Latches**99-08710B(3)(a) General**

Lock Throw: Comply with length of bolts required for labeled fire-rated doors and the following:

1. Cylindrical Lockset: At least 1/2-inch latchbolt throw
2. Mortise Lockset: At least 3/4-inch latchbolt throw
3. Deadbolt: At least 1-inch bolt throw

Lock Backset: 2-3/4 inches, unless otherwise described.

Strike: Manufacturer's standard strike for each lock bolt or latchbolt, with strike box and curved lip extended to protect frame. Furnish (1) flat-lip strike for three-piece antifriction latchbolts where instructed by the lock manufacturer, (2) extra-long-lip strike for frames with applied wood casing trim, or (3) manufacturer's specific aluminum strike box for aluminum frames.

99-08710B(3)(b) Cylindrical Locksets

Cylindrical locksets must be series 4000, non handed steel lock chassis, SFIC, self aligning trim with concealed through bolts. Include the following:

1. Lever: Curved or-contour with angled return to be within 1/2-inch of the door. On exterior doors, free wheeling exterior lever when locked.
2. Rose: Chromium, flat with rounded edge.
3. Latchbolt: Chrome, square corner. Same manufacturer as lockset.
4. Screws: Supplied with lockset.

Entrance lockset must be Function F109 with dual levers and roses. Passage lockset must be Function F75 with dual levers and roses. Privacy lockset must be Function F76A, dual levers and roses, with coin turn outside and thumbscrew turn inside.

99-08710B(3)(c) Mortise Locksets

Mortise locksets must be series 1000, non handed steel lock case, SFIC, self aligning trim with concealed screws. Include the following:

1. Lever: Curved or contour with angled return to be within 1/2 inch of the door. On exterior doors, free wheeling exterior lever when locked.
2. Escutcheon: Stainless steel with standard cylinder.
3. Rose: Stainless steel, flat with rounded edge.
4. Latchbolt: Anti friction latchbolt, supplied with lockset.
5. Screws: Supplied with lockset.

Exit lockset must be Function F12, dual levers with exterior escutcheon and interior rose, and 1-inch throw stainless steel deadbolt. Passage lockset must be Function F01 with dual levers and roses. Privacy lockset must be Function F22, dual levers and roses, with coin turn outside and thumbscrew turn inside.

99-08710B(3)(d) Auxiliary Locks

Single cylinder deadbolt must be Function E2151, free spinning solid brass cylinder collar and security shield, non handed, steel alloy deadbolt with anti-saw center, SFIC, with concealed through bolts.

99-08710B(3)(e) Lock Cylinders

Lock cylinders must be a master key system.

Lock cylinders must be tumbler type, constructed from nickel silver, and same manufacturer as locking devices. Cylinders must be SFIC type, interchangeable cores with six pin barrels, and face finished to match lockset.

Temporary cores must be SFIC type with interchangeable cores with six pin barrels. Temporary cores must be a change key system. Temporary cores and keys must not be the Department's permanent keying system or furnished on the same keyway or key section as the Department's permanent keying system. Temporary cores will remain Department property.

Keys must be nickel silver and same manufacturer as locking devices. Furnish 2 change keys per temporary core. Furnish 2 blank keys per permanent core. Stamp change key bows and blank key bows "State of California" and "Do Not Duplicate."

99-08710B(4) Electric Strikes

Not Used

99-08710B(6) Flush Bolts

Not Used

99-08710B(7) Accessories For Pairs Of Doors

Not Used

99-08710B(8) Surface Closer

Door Closers: Surface mounted, aluminum cover, non handed, field adjustable sizes 1 through 6, parallel arm set with hold open and stop. Include separate adjusting valves for closing, latching speed, and backcheck. Use drop brackets at narrow head rails.

99-08710B(9) Exit Devices

Not Used

99-08710B(10) Operating Trim

Push Plates and Pull Plates: Beveled edges, stainless steel, and size 16 by 4 inches. Push plate must be Type J301. Pull plate must be Type J405, with one-inch diameter round pull and 1 1/2-inch standoffs on 8-inch centers.

99-08710B(11) Protective Trim Unit

Kickplates: Beveled edges, stainless steel, countersunk screw holes, width 2 inches less than door width for single doors, and 1-inch less than door width each for door pairs. Kickplate must be Type J102, 12 inches tall. .

99-08710B(12) Mechanical Stops and Holders

Floor Stops: Dome type, Type L12141 or L12161 as required, countersunk screw holes, non marring rubber bumper, and height for threshold or non threshold door frame as required.

Wall Stops and Door Mounted Stops: Wall type, 3 1/2-inch projection, Type L12011 or L12021 as required, countersunk screw holes, and non marring rubber tip.

Wall Bumpers: Wall type bumper, Type L22101 or L22201 as required, no visible screw holes, and convex rubber pad.

99-08710B(13) Door Gasketing

Door Shoe with Rain Drip: Mill-finished aluminum with neoprene insert, end covers, and formed rain drip.

Door Sweep: Mill-finished aluminum and neoprene.

Overhead Door Drip: Mill-finished aluminum 2-1/2 inches wide.

Door Gasketing: Bumper-type resilient inserts with retainer strips and surface applied. Perimeter seals must meet performance tests for heat, cold, air leakage, and smoke. At astragals, furnish a compression bulb resilient pressure sensitive door gasketing. Materials must be NRTL listed where used with labeled assemblies.

99-08710B(14) Thresholds

Thresholds must be factory non-slip mill-finished aluminum, nominal 6 inches wide unless otherwise shown, and full width of opening described.

Threshold bedding sealant must be weatherproof silicone sealant and adhesive.

Threshold must be ADA compliant.

99-08710B(15) Shop Fabrication

Manufacturer's Nameplate: Do not use products that have manufacturer's name or trade name displayed in a visible location except with required fire-rated labeling. Manufacturer's identification will be permitted on lock cylinder rims.

Base Metals: Furnish door hardware items of base metal specified, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware items. Do not use a manufacturer's standard materials or forming methods if different from the specified standard.

Fasteners: Screws must comply with commercially recognized industry standards for application intended. Furnish Phillips oval-head screws finished to match surface of door hardware. Furnish fire-rated fasteners for labeled assemblies for the following:

1. Hinges mortised to wood doors or frames.
2. Strike plates to wood frames.
3. Closers to wood doors and frames.
4. Surface hinges to steel doors.
5. Closers to steel doors and frames.
6. Surface-mounted exit devices to steel doors and frames.
7. Spacers or sex bolts for through bolting of hollow-metal doors.

Do not use aluminum fasteners. Furnish noncorrosive fasteners for exterior door gasketing applications.

99-08710B(16) Finishes

Interior Hardware: Standard Finish 626 (US 26D), satin chromium.

Exterior Hardware: Standard Stainless Steel Finish 630 (US 32D), satin stainless steel. Where shown, use Standard Finish 626 (US 26D), satin chromium.

Factory Covering: Apply a strippable, temporary protective covering to exposed finishes before shipping.

99-08710C Construction

99-08710C(1) General

Doors and Frames: Doors and frames must be set square, plumb, and properly prepared before hardware installation.

99-08710C(2) Examination

Doors and Frames: Examine doors and frames for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting door hardware installation.

Electrified Door Hardware: Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

99-08710C(3) Installation

Furnish heavy weight hinges for (1) interior doors with closers or panic devices, (2) interior doors wider than 3'-5", and (3) exterior doors. You must use 4 1/2-inch hinges unless otherwise described.

Furnish standard weight hinges for interior doors unless otherwise specified. For doors 2'-0" wide you must use 3-inch hinges. For doors wider than 2'-0" you must use 3 1/2-inch hinges.

Hardware items must be accurately fit, securely applied, adjusted, and lubricated to comply with the manufacturer's instructions. Hardware items must operate without binding or excessive play.

Hinges must be installed at equal spacing with the end hinges not more than 9 5/8 inches from the top and bottom of the door. Kickplates and mop plates must be mounted on the push side of the doors, 1 inch up from bottom edge.

Thresholds must be set in a continuous bed of bedding sealant.

Mechanical stops on concrete surfaces must be attached with expansion anchoring devices. Mechanical stops mounted elsewhere must be attached with wood screws. Do not locate stops in the path of travel.

Hardware, except hinges, must be removed from surfaces to be painted before painting. Do not install surface-mounted items until finishes have been completed on substrates involved. Painting must comply with section 99-09900.

Furnish all dogging keys, closer valve keys, lock spanner wrenches, other factory furnished installation aids, instructions, and maintenance guides to the Engineer.

Install continuous weatherstripping at each edge of exterior door leaf. Seal finish must match adjacent frame color.

Door closer must be adjusted so that from an open position of 90-degrees, the time required to move the door to a position of 12-degrees from the latch must be five seconds minimum.

99-08710C(4) Lock Cylinders

Install temporary cores in all lockable doors during construction.

Furnish permanent cores and keys to the Engineer before Contract acceptance. The Department will install permanent cores.

99-08710C(5) Cleaning and Protection

Clean adjacent surfaces soiled by door hardware installation.

Clean hardware items as necessary to restore proper function and finish.

Furnish final protection and maintain conditions that ensure that door hardware is without damage or deterioration before Contract acceptance.

99-08710C(6) Adjusting

Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of HVAC equipment.

99-08710C(7) Door Hardware Schedule

Furnish hardware sets as specified in the following tables:

DOOR HARDWARE SET 1

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111	1-1/2 pair
2	Mortise lockset and latch	Deadbolt with lever operated	1
3	Lock cylinder		1
4	Surface closer	Dead-stop arm	1
5	Gasketing	Brush weatherstrip with rain drip	1
6	Gasketing	Integral weatherstripping	1
7	Threshold	Aluminum	1
8	Protective trim unit	Kick plate	2

DOOR HARDWARE SET 2

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111	1-1/2 pair
2	Cylindrical auxiliary deadbolt	Privacy	1
3	Lock cylinder		1
4	Operating trim	Push and pull plates	1 each
5	Mechanical stops and holders	Wall Bumper	1

DOOR HARDWARE SET 3

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111	1-1/2 pair
2	Cylindrical lockset and latch	Privacy	1
3	Cylindrical auxiliary deadbolt	ADA Indicator deadbolt w/ thumbturn	1
4	Mechanical stops and holders	Wall Bumper	1
5	Protective trim unit	Kick Plate on push side of door	1

99-08710D Payment

Not Used

99-08810 GLAZING

99-08810A General

99-08810A(1) Summary

Section 99-08810 includes specifications for installing glazing.

Glazing for windows, doors, and other glazed openings includes:

1. Glass

99-08810A(2) Definitions

SHGC: Solar Heat Gain Coefficient.

Surface: Surfaces of lites numbered inward with the exterior surface being the 1st surface.

99-08810A(3) Submittals

Submit manufacturer's product data including catalog cuts, performance data, installation instructions, and additional documentation.

Submit the installation schedule. Each location must include the location, size, and glazing type.

Submit adhesion and compatibility testing reports. Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants. Testing will not be required if data is submitted based on previous testing of current sealant products and glazing materials matching those submitted.

For materials that fail tests, submit manufacturer's instructions for corrective measures, including use of specially formulated primers.

Submit glazing samples for each type of glazing product, 12-inch square minimum.

Submit samples of manufacture warranty.

99-08810A(4) Quality Control and Assurance

Installed glazing system must withstand normal thermal movement, wind and impact loads, where applicable, without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation, failure of sealant or gaskets to remain watertight and airtight deterioration of glazing materials; or other defects in construction.

99-08810A(5) Labels

Each individual pane of heat strengthened or tempered glass must bear an identification label complying with ASTM C 1048.

Each individual pane of bullet-resistant glass must bear an identification label of performance complying with UL 752 or ASTM F 1233.

Safety glass must be permanently labeled under 24 CA Code of Regs, pt 2, § 2406.

99-08810B Materials

99-08810B(1) General

Glass must be clear glass unless otherwise shown and comply with ASTM C 1036 and the following:

1. Tempered glass must also comply with ASTM C 1048.
2. Heat strengthened glass must also comply with ASTM C 1048.

Furnish glass thicknesses specified unless otherwise shown.

99-08810B(2) Glazing

Float Glass:

Float glass must be Type I, Class 1, Quality-Q3 glass. Tinted glass must be transparent, Type 1, Class 2, Quality-Q3 glass and all the same tint.

Float glass thickness must be:

1. 1/8-inch thick for panes less than 10 square feet
2. 3/16-inch thick for panes between 10 and 28 square feet
3. 1/4-inch thick for panes over 28 square feet

Tempered Glass: Tempered glass must be Kind-FT, Condition-A, Type 1, Class 1, and Quality-Q3 glass.

Heat Strengthened Glass: Heat strengthened glass must be Kind-HS, Condition A, Type 1, Class 1, and Quality-Q3 glass.

Low-e Coated Glass: Low-e coated glass must be clear glass complying with ASTM C 1376 with a clear coating.

Insulating Glass Assemblies:

Insulating glass assemblies must be clear, low-e coated, insulating glass.

Insulating glass assemblies must be factory assembled sealed lites of glass separated by a dehydrated interspace with desiccant, manufacturer's standard spacer with dual seals, and qualified under ASTM E 2190.

Basic Assemblies: The outdoor lite must be clear tempered glass. The indoor lite must be clear float glass with hard coat low-e coating on the inner surface.

Bullet-Resistant Assemblies: The outdoor lite must be 1-1/4-inch clear bullet-resistant glass-glad polycarbonate glass. Airspace must be 1/2-inch thick. The indoor lite must be 1/4-inch heat strengthened clear float glass with hard coat low-e coating on the inner surface.

The insulated glass assemblies must have:

1. Maximum nighttime U-factor: 0.28.
2. Maximum daytime U-factor: 0.26.
3. Maximum SHGC: 0.27
4. Minimum visible light transmittance: 0.64.
5. Maximum shading coefficient: 0.32.

Bullet Resistant Glass: Bullet resistant glass must have a power rating of "Super – 0.44 Magnum" under UL 752 Level 3, or an equivalent rating under ASTM F 1233, Ballistics Class HG4, "Handgun – High." Exterior surface must be mar-resistant. Bullet resistant glass must meet the following:

1. Glass-clad polycarbonate complying with ASTM C 1349.
2. U-Value: 1.00 Maximum
3. Daylight Transmittance: 68 percent
4. Exterior Daylight Reflectance: 8 percent
5. Shading Coefficient: 0.50 percent
6. Ultraviolet Blockage: 99 percent

Miscellaneous Materials: Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels must be top grade, commercial quality, complying with the glass or sheet manufacturer instructions and complying with GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

99-08810C Construction

99-08810C(1) Installation

Glazing must be installed under the GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

Panes must be bedded fully and evenly, set straight and square within panels so that the pane is entirely free of any contact with metal edges and surfaces.

For panes on the exterior of buildings, the glazing on both sides of the panes must provide a watertight seal and watershed. Seals must extend no more than 1/16-inch beyond the holding members. A void must be left between the vertical edges of the panes and the glazing channel. Weep systems must be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing must be set under the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Laminated glass must be set on setting blocks.

Whenever welding or burning of metal is in progress within 15 feet of glazing materials, a protective cover must be provided over exposed surfaces.

99-08810C(2) Replacement and Cleanup

Panes must be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials must be removed during the work life of the sealant.

Solvents and cleaning compounds must be chemically compatible with materials, coatings and glazing compounds. Cleaners must not have abrasives that scratch or mar the surfaces.

The protective covering on plastic sheet surfaces must not be removed until construction is completed or 2 weeks after glazing, whichever is shorter. The covering must be removed before adhesives dry sufficiently to adhere to the sheet during removal rather than the protective membrane.

All broken, scratched, or cracked glass must be replaced before Contract acceptance.

Paint, dirt, stains, labels, and surplus glazing compound must be removed without scratching or marring the surface of the panes or metal work, except do not remove etched labels.

99-08810D Payment

Not Used

99-9 FINISHES

99-09250 GYPSUM WALLBOARD

99-09250A General

99-09250A(1) Summary

Scope: This work consists of installing and finishing gypsum wallboard.

Where assembly fire ratings are shown, construction must provide the fire resistance under the applicable standards in the *Fire Resistance Design Manual* published by the Gypsum Association.

99-09250A(2) Definitions

Not Used

99-09250A(3) Submittals

Product Data: Submit manufacturer's descriptive data and installation instructions.

99-09250A(4) Quality Control and Assurance

Not Used

99-09250B Materials

99-09250B(1) General

Gypsum wallboard must be mold-, mildew-, and moisture-resistant. Use mold- and moisture-resistant joint tape and compound. You may use cementitious backer board.

Use mold-, moisture-, and water-resistant gypsum board as backing boards for (1) tile, (2) rigid sheet wall covering, and (3) wainscoting. You may use cementitious backer board.

Use mold- and moisture-resistant joint tape and finishing compound with mold-, moisture-, and water-resistant gypsum board.

99-09250B(2) Delivery and Storage

Materials must be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and must be kept dry and fully protected from weather and direct sunlight exposure. Gypsum wallboard must be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

99-09250B(3) Gypsum Wallboard

Gypsum Wallboard: Gypsum wallboard must comply with ASTM C 1396. Gypsum board must be Type X with tapered edges.

Mold-, Mildew-, and Moisture-Resistant Gypsum Board: Mold-, moisture-, and water-resistant gypsum board must achieve a mold resistance rating of 10 under ASTM D 3273 and evaluated under ASTM D 3274. Furnish one of the following types:

1. Glass mat water-resistant gypsum panel with glass mat facings and water-resistant fiber-reinforced gypsum core, and complying with ASTM C 1658/C 1658M. Glass mat water-resistant gypsum panel must be Georgia-Pacific DensArmor Plus Fireguard Paperless Interior Drywall, or equal.
2. Fiber-reinforced water-resistant gypsum panel, unfaced with water-resistant core, and complying with ASTM C 1278/C 1278M. Fiber-reinforced water-resistant gypsum panel must be US Gypsum Fiberock Aqua-Tough Interior Gypsum Panel, or equal.
3. Gypsum panel with paper faces treated with an antimicrobial agent and containing core additives to add resistance to mold, mildew, and moisture and complying with ASTM C 1396/C 1396M. Gypsum panel must be National Gypsum Gold Bond XP Fire Shield Gypsum Wallboard, or equal.

Joint Tape and Joint and Finishing Compound: Joint tape and joint and finishing compound must comply with ASTM C 475.

Mold and Moisture Resistant Joint Tape and Finishing Compound: Mold and moisture resistant joint tape and finishing compound must comply with ASTM C 475. Joint tape must be glass mesh or as recommended by gypsum board manufacturer. Joint compound must be setting-type joint or as recommended by gypsum board manufacturer. Compound must achieve a mold resistance rating of 10 under ASTM D 3273 and evaluated under ASTM D 3274.

Corner Beads, Metal Trim and Control Joints: Corner beads, metal trim and control joints must be galvanized steel of standard manufacture.

Resilient Metal Channel: Resilient metal channel must be galvanized sheet steel channels of standard manufacture designed to reduce sound transmission through wood frame partitions.

Fasteners: Fasteners must be gypsum wallboard nails complying with ASTM C 514 or steel drill screws complying with ASTM C 1002.

Cementitious Backer Board: Cementitious backer board must be non-asbestos fiber-mat reinforced cementitious backer board complying with ASTM C 1325.

99-09250C Construction

Install wallboard panels on ceilings and soffits with the long dimension of the panels perpendicular to the framing members. Install wallboard panels on walls with the long dimension of the panels either parallel or perpendicular to the framing members. The direction of the panels must be the same on any 1 wall or partition assembly.

Edges of wallboard panels must be butted loosely together. All cut edges and ends must be smoothed as needed for neat fitting joints.

All edges and ends of gypsum wallboard panels must coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceilings and on the opposite side of partition assemblies must be staggered.

Gypsum wallboard panels for shear wall sheathing or fire resistive assemblies must be fastened to all framing members. Gypsum wallboard panels at other locations and gypsum wallboard finish over plywood sheathed shear walls must be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls, first install ceiling panels with the fasteners terminating at a row 7 inches from the walls, except for walls parallel to ceiling framing. Wall panels must butt the ceiling panels. The top row of wall panel fasteners must terminate 8 inches from the ceiling.

At internal vertical angles formed by the walls, fasteners must not be installed along the edge or end of the panel that is installed first. Fasteners must be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Adhesives must not be used for securing wallboard to framing.

Except where closer spacing is shown, spacing of fasteners must not exceed (1) 7 inches for nails, (2) 12 inches for screws, and (3) 8 inches for screws at the perimeter of panels for fire resistive assemblies having metal framing.

Use Type S steel drill screws to fasten wallboard to metal framing. Use nails or Type W steel drill screws to fasten wallboard to wood framing. Screws must not be used in fire resistive assemblies unless otherwise shown.

Fasteners must be located at least 3/8 inch from wallboard panel edges and ends. Nails must penetrate into wood framing at least 1-1/8 inches. Screws must penetrate into wood framing at least 5/8 inch. All metal fasteners must be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim must be installed at all free edges of panels, where wallboard panels abut dissimilar materials and at locations shown. Corner beads must be installed at external corners. Control joints must be installed at the locations shown.

Joints in mold-, moisture-, and water-resistant gypsum board must not be taped or filled and dimples at the fastener heads must not be patched. Edges of cuts and holes in backing board must be sealed with a primer or sealer that is compatible with the wall covering or wainscoting adhesive to be used.

All other joints must be filled and finished with joint tape and at least 3 coats of joint compound (1) between face panels, (2) the internal angles formed by ceiling and walls and (3) the internal vertical angles formed by walls. Tape in the corners must be folded to comply with the angle of the corner. Tape at joints and corners must be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities must be patched with joint compound. Each patch must consist of at least 3 coats and each coat must be applied in a different direction.

Flanges of corner beads, control joints and trim must be finished with a least 3 coats of joint compound.

Each coat of joint compound must be feathered out onto the panel surface and must be dry and lightly sanded before applying the next coat. The finished surfaces of joint compound at the panel joints, internal angles, patches and at the flanges of trim, corner beads and control joints must be flat and true to the plane of the surrounding surfaces and must be lightly sanded.

Good lighting of the work area must be provided during the final application and sanding of the joint compound.

Surfaces of wallboard to be textured must receive an orange peel texture, unless otherwise shown.

99-09250D Payment

Not Used

99-09614 DETECTABLE WARNING SURFACE**99-09614A General****99-09614A(1) Summary**

This work consists of installing detectable warning surfaces embedded within a five-inch deep concrete slab.

99-09614A(2) Definitions

Not Used

99-09614A(3) Submittals

Submit manufacturer's descriptive data, color and texture samples, installation instructions, and warranty documentation. Submit 2 samples, each at least 6 by 6 inches.

99-09614A(4) Quality Control and Assurance

Not Used

99-09614A(5) Warranty

The manufacturer must provide a 5-year warranty for the detectable warning surface, guaranteeing replacement when there is a defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. Begin warranty period upon Contract acceptance.

99-09614B Materials**99-09614B(1) General**

Detectable warning surfaces must be listed on the Authorized Material List and comply with 2019 CBC §§ 11B-705 "Detectable Warnings and Detectable Directional Texture".

Detectable warning surface must be prefabricated, flush mounting, truncated dome panels. Dimensions and spacing must be as shown. The color of the detectable warning must be yellow complying with FED-STD-595, Color No. 33538.

Adhesives, fasteners, and sealant must comply with the manufacturer's instructions.

99-09614B(2) Delivery, Storage, and Handling

Deliver materials to the job site in the manufacturer's original and unopened containers that bear labels showing type of material. Package finished surfaces with protective wrappings to protect panels from residue before and during installation.

99-09614C Construction

Install securely under the manufacturer's installation instructions.

99-09614D Payment

Not Used

99-09659 RESILIENT BASE**99-09659A General****99-09659A(1) Summary**

Scope: This work consists of installing resilient base.

99-09659A(2) Definitions

Not Used

99-09659A(3) Submittals

Submit the manufacturer's descriptive data, installation instructions, and samples of resilient base. Samples must be at least 2 inches in length. Submit the manufacturer's color palette for finish color selection.

99-09659A(4) Quality Control and Assurance

Not Used

99-09659B Materials

Resilient Base: Resilient base must be manufacturer's best grade, rubber or vinyl base, with premolded internal and external corner pieces. The height and color must be as shown.

Adhesive: Adhesive must be per the base manufacturer's instructions.

99-09659C Construction

Bases must be firmly and completely attached to walls with adhesive and must be accurately scribed to trim, molding, and cabinets. All joints must be tight fitting. Bases between premolded corners or other termini must be (1) installed continuous or (2) installed using 4-foot minimum standard manufactured lengths. Filler pieces must be not less than 18 inches.

99-09659D Payment

Not Used

99-09661 VINYL COMPOSITION TILE**99-09661A General****99-09661A(1) Summary**

Scope: This work consists of installing vinyl composition tile.

Vinyl composition tile consists of vinyl composition tile, edger strips, floor wax, and tile manufacturer's recommended primers and adhesives.

99-09661A(2) Definitions

Not Used

99-09661A(3) Submittals

Manufacturer's descriptive data, installation instructions, color and pattern samples must be submitted. Samples of tile must be 12" x 12" in size.

99-09661A(4) Quality Control and Assurance

Not Used

99-09661B Materials

Vinyl Composition Tile: Vinyl composition tile must be semi-flexible, 3/32-inch minimum thickness, 12" x 12" tile complying with ASTM F 1066, Type IV. Color and pattern must be as shown.

Primer, Leveling Compound Crack Filler and Adhesives: Primer, leveling compound crack filler and adhesives must be waterproof types as recommended by the tile manufacturer.

Wax: Wax must be water emulsion, self-polishing type containing not less than 16 percent wax solids, wetting agents, and a nonslip agent. The wax must meet UL antislip standards.

Edger Strips: Edger strips must be commercial quality, stainless steel or aluminum.

99-09661C Construction**99-09661C(1) Preparation**

Before placing adhesives, all surfaces to receive vinyl composition tile must be made free of localized depressions or bumps. Bumps must be ground flat. Holes, depressions, and cracks must be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered must be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces, or other irregularities and must be broom clean. Primer, when recommended, must be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and must be completely dry before the application of adhesives.

The rooms where tile is to be installed must be maintained at a temperature of at least 70°F for not less than 72 hours before installation, during installation and for 5 days after installation.

99-09661C(2) Application

Tile must be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints must be tight fitting. Floor covering must be placed before floor mounted fixtures are installed. After tile has been set, the finished surface must be rolled and crossrolled with a roller weighing 100 pounds or more.

Edger strips must be installed at free edges.

Where tile patterns between rooms differ, the pattern break at openings must occur at the centerline of the common wall.

Upon completion of the tile application, all stains, surplus adhesive, dirt and debris resulting from the work must be removed and the floor left broom clean. Tile must be protected from damage at all times during construction. As a last order of work, tile must be washed with soap and warm water, rinsed, and then polished under the tile manufacturer's instructions. Not less than 2 applications of wax must be placed on the tile flooring.

99-09661D Payment

Not Used

99-09900 PAINTING

99-09900A General

99-09900A(1) Summary

Scope: This work consists of preparing surfaces to receive coatings and applying coatings.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment described.

99-09900A(2) Definitions

Detergent Wash: Removal of dirt and water-soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

Hand Cleaning: Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint that is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

Mildew Wash: Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

Abrasive Blasting:

Removal of loosely adhering paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, must be by the use of airborne abrasives. Loose particles, dust, and abrasives must be removed by blasting with clean, oil-free air.

Abrasives must be limited to mineral grit, steel grit, or steel shot, and must be graded to produce the surface profile recommended in the manufacturer's data sheet.

Steam Cleaning: Removal of oil, grease, dirt, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP Wash: Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

Water Blasting: Removal of dirt, loose scale, chalking, or peeling paint by low-pressure water cleaning. Water blasting must be performed under SSPC-SP12 and must produce a surface cleanliness meeting SSPC-SP12-WJ4. Equipment used must have a minimum flow rate of 1.5 gpm. If a detergent solution is used, it must be biodegradable and must be removed from all surfaces with clean water.

99-09900A(3) Submittals

Product Data:

Manufacturer's descriptive data, a materials list, and color samples must be submitted.

Product descriptive data must include product description, manufacturer's instructions for product mixing, thinning, tinting, handling, site environmental requirements, product application, and drying time.

Materials list must include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Samples: Submit color samples. Samples must be manufacturer's color cards, nominally 2 by 3 inches for each color of coating shown. Color samples for stains must be submitted on wood of the same species, color, and texture as the wood to receive the stain.

Certificates of Compliance: Submit certificates of compliance for products required to comply with SSPC standards.

99-09900A(4) Quality Control and Assurance

Not Used

Regulatory Requirements: Coatings and applications must comply with the rules for control of VOC emissions adopted by the South Coast Air Quality Management District (SCAQMD).

99-09900A(5) Site Environmental Requirements

Coatings must be applied under the environmental constraints specified in the manufacturer's instructions. These conditions must be maintained until the coating has cured and is ready for recoat.

Continuous ventilation must be provided during application of the coatings.

Adequate lighting must be provided while surfaces are being prepared for coatings and during coating applications.

99-09900A(6) Maintenance Stock

Upon completion of coating work, deliver a full one-gallon container of each type and color of finish coat and stain used to the Engineer. Containers must be tightly sealed, have the manufacturer's standard product label, and be labeled with color, texture, and room locations where used.

99-09900B Materials

99-09900B(1) General

Products for each coating system must be from a single manufacturer and must comply with the Detailed Performance Standards of the Master Painters Institute (MPI). Each product must be shown on the MPI Approved Products List unless otherwise specified.

99-09900B(2) Delivery, Storage, and Handling

Products must be delivered to the site in sealed, labeled containers and stored in a well-ventilated area at an ambient air temperature of at least 45 degrees F. Container labeling must include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

99-09900C Construction

99-09900C(1) Inspection

Coatings must not be applied until surface preparation has been accepted by QC and authorized by the Engineer. Notify the Engineer at least 3 business days before application of coatings.

99-09900C(2) Surface Preparation

Prepare surfaces for coating under the coating manufacturer's instructions unless otherwise specified.

Remove hardware, cover plates, light fixture trim, and similar items before preparing surfaces for coating. Following the application of the finish coating, the removed items must be reset in their original locations.

Wood:

Lightly sand exterior surfaces no more than 24 hours before applying coatings.

Apply a sealer under the coating manufacturer's instructions to knots, sap, pitch, tar, creosote, and other bleeding substances.

After applying the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities must be filled, hand cleaned, and spot primed to provide smooth surfaces before applying finish coats.

Irregularities in wood surfaces to receive a transparent stain finish must be filled and hand cleaned after the first coat of stain has been applied. The color of the filler must match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish must be filled and hand cleaned before applying coatings. The color of the filler must match the color of the coated wood.

Galvanized Metal:

New surfaces must be roughened by hand sanding or light abrasive blasting. Galvanizing must not be removed during cleaning or roughening.

Damaged or corroded areas must be cleaned and given 2 spot applications of a coating that complies with the Detailed Performance Standards of the MPI, and listed on MPI List "Number 18, Primer, Zinc Rich, Organic."

Steel and Other Ferrous Metals: Surface must be cleaned and prepared under SSPC-SP 6 as needed to ensure they are free of rust, mill scale, and other contaminants. Surface profile must be a minimum of 1.5 mils.

Aluminum and Other Non-ferrous Metals: Surface must be cleaned under SSPC-SP 1.

Gypsum Board: Holes, cracks, and other surface imperfections must be filled with joint compound or suitable filler before applying coatings. Taped joints and filled areas must be hand sanded to remove excess joint compound and filler.

Cement Plaster: New plaster must be cured at least 14 days before coating. Cracks, holes, and surface imperfections must be filled with patching plaster and hand textured to match adjacent surfaces.

Concrete and Concrete Masonry Unit: New material must be cleaned and prepared under SSPC-SP 13. Cracks and voids must be filled with cement mortar patching material. Concrete must be cured until the surface moisture is below the level specified in the coating manufacturer's instructions.

Previously Coated Surfaces:

Dirt, oil, grease, or other surface contaminants must be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections must be filled as specified for new work. Mildew must be removed by mildew wash. Chalking paint must be removed by hand cleaning. The surfaces of existing hard or glossy coatings must be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting must not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings must be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas must be pretreated and primed as specified for new work.

99-09900C(3) Application

Coatings must be applied under the manufacturer's instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

Mixing, thinning and tinting must comply with the manufacturer's instructions. After thinning, the coating must comply with the regulatory requirements.

Coatings must be applied only when surfaces are dry and properly prepared.

Cleaning and painting must be scheduled so that dust and other contaminants from the cleaning process do not fall on wet, newly coated surfaces.

Materials required to be coated must have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

Surface Finish Application:

Each coat must be applied to a uniform finish. Finished surfaces must be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system must closely resemble the final color coat, except each application must provide enough contrast in shade to distinguish the separate applications.

Work Required Between Applications:

Each application of material must be cured under the coating manufacturer's instructions before applying the next coating.

Enamels and clear finishes must be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer must be spot applied whenever bleeding substances are visible through the previous application of a coating.

Timing of Applications: The first application of the coating system must be during the same work shift that the final surface preparation was performed. Additional coats must be applied as soon as the required drying time of the preceding coat, specified in the coating manufacturer's instructions, has been met.

Application Methods:

Coatings must be applied by brush, roller or spray. Rollers must not leave a stippled texture in the paint film. Extension handles for rollers must not be greater than 6 feet in length.

If spray methods are used, surface deviations and imperfections such as overspray, thickness deviations, lap marks, and orange peel must be considered as evidence the work is unsatisfactory and you must apply the remainder of the coating by brush or roller, as authorized by the Engineer.

Back Priming: The first application of the coating system must be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the job site. Surfaces of interior finish woodwork that adjoin concrete or masonry must be coated with one application of exterior wood primer before installation.

Patches in Previously Coated Surfaces: Where patches are made on surfaces of previously coated walls or ceilings, the entire surface to corners on every side of the patch must be coated with at least 1 application of the finish coat.

Finishing Mechanical and Electrical Components:

Shop primed mechanical and electrical components must be finish coated under the coating system specified for the substrate material. Louvers, grilles, covers, and access panels on mechanical and electrical components must be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers must be coated with one application of flat black enamel, to the limit of the sight line.

Conduit, piping, and other mechanical and electrical components visible in the finished work must be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment must be finish coated before installing equipment.

99-09900C(4) Cleaning

Upon completion of all operations, the coated surfaces must be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of your operations must be repaired, to match the condition of the surfaces before the beginning of your operations.

99-09900C(5) Protection

Provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted must be removed at your expense and the original surface must be restored.

99-09900C(6) Coating System

The surfaces to be coated must be as described. When a coating system is not described for a surface to be finish coated, use the coating system as specified below for the substrate material. The number of applications specified for each coating system specified is a minimum. Additional coats must be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1 - ALUMINUM AND OTHER NON-FERROUS METALS

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

SYSTEM 2 - GALVANIZED METAL

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

SYSTEM 3 - GYPSUM BOARD

One Prime Coat:

Primer Sealer: Latex, Interior, MPI List Number 50

2 Finish Coats:

Semi-Gloss: Latex, Interior, MPI Gloss Level 5, MPI List Number 54

SYSTEM 4 - PREVIOUSLY COATED EXTERIOR SURFACES

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 5 - STEEL AND OTHER FERROUS METALS, NON-CORROSIVE ENVIRONMENT

VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15
Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

NOT VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15
Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

SYSTEM 6 - WOOD, PAINTED

1 Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 7 - FIBER CEMENT BOARD

Prime Coat:

Primer: Panels pre-primed from manufacturer.

2 Finish Coats:

Semi-Gloss: High quality waterborne 100% Acrylic Exterior, MPI Gloss Level 5, MPI List Number 10.

99-09900C(6) Color Schedule

Colors must be as shown.

99-09900D Payment

Not Used

99-09953 FIBERGLASS REINFORCED PLASTIC PANELS

99-09953A General

99-09953A(1) Summary

Scope: This work consists of installing FRP panels and trim molding.

99-09953A(2) Definitions

FRP: fiberglass reinforced plastic.

99-09953A(3) Submittals

Submit manufacturer's descriptive data, installation instructions, and finish options.

Installation instructions must show the FRP panel manufacturer's method of installation.

Submit the manufacturer's standard color palette for FRP panels and trim molding. Color must be as shown.

99-09953A(4) Quality Control and Assurance

Not Used

99-09953B Materials

FRP Panels: FRP panels must have a Class A flame-spread rating and minimum nominal thickness of 0.090 inch. FRP panels must be Marlite, Class I/A FRP; Kemlite, Fire-X Glasbord; or equal.

Trim Molding: Trim molding must be the FRP manufacturer's standard vinyl molding with nailing flanges and a 3/8-inch deep channel of sufficient width to receive panels and sealant.

Adhesives and Sealants: Adhesives and sealants must be per the FRP panel manufacturer's instructions.

99-09953C Construction

99-09953C(1) General

Not Used

99-09953C(2) Installation

Install the FRP panels and trim molding under the manufacturer's installation instructions.

Nail the trim molding through the flange into solid wood backing. All nails must be concealed by the FRP panels in the completed installation. Trim must be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard trim length. If more than one trim piece is used on one wall, the pieces must be approximately equal length and at least 4 feet in length. All FRP panel edges must be covered by a trim molding.

FRP panels must be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard panel length. If more than one panel piece is used on one wall, the panels must be approximately equal length and at least 4 feet in length.

99-09953C(3) Clean-up

Protect adjacent surfaces from adhesive and sealant. Remove excess adhesive and sealant as the installation progresses using a solvent or cleaning agent under the FRP panel manufacturer's instructions.

99-09953D Payment

Not Used

99-10 SPECIALTIES

99-10264 BULLET RESISTANT PANELS

99-10264A General

99-10264A(1) Summary

Scope: This work consists of installing bullet resistant fiberglass panels.

99-10264A(2) Performance Requirements

Bullet resistant fiberglass panels must be non-ricochet type, to permit the encapture and retention of an attacking projectile lessening the potential of random injury or lateral penetration.

Panel Rating: UL 752 Level 3.

Bullet resistance of joints: equal to that of the panel.

99-10264A(3) Submittals

Product Data: Manufacturer's descriptive data, installation instructions and samples must be submitted.

Certificate of Compliance: Submit certificates of compliance for the bullet resistant panels.

99-10264A(4) Quality Control and Assurance

Manufacturer must specialize in manufacturing products of the specified type with a minimum of three years' experience.

Installer must specialize in product type.

Regulatory Requirements:

UL Listing Verification and UL752 Current Test Results provided by Underwriters Laboratories.

NIJ Standard 0108.01: Standard for Ballistic Resistant Protective Materials, Level IIIA.

MIL-P-46593A: Projectile, Calibers .22, .30, .50 and 20 MM Fragment & Simulating.

MIL-STD-622F, Military Standard: V₅₀ Ballistic Test for Armor.

Manufacturer's third party certificate of registration with ISO 9001:2015.

Manufacturer's U.S. Depart. Of State ITAR Statement of Registration.

99-10264A(5) Delivery, Handling and Storage

Materials must be protected from damage. Components must be delivered to the job site in manufacturer's unopened containers, fully identified with name, brand and UL Listed labels intact and legible. Panels must be stored indoor under cover, off ground in a dry, ventilated space.

Project conditions, including temperature, humidity and ventilation, must be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

99-10264A(6) Warranty

Manufacturer's Warranty: Warrant all materials and workmanship against defects for a period of five years from the date of work completion.

99-10264B Materials

Panels must be fabricated multiple layers of woven roving ballistic grade fiberglass cloth impregnated with the thermoset polyester resin and compressed into flat rigid sheets.

Fabrication: Technique and materials used must provide the controlled internal delamination to permit the encapture of the penetrating projectile. Exposed fasteners must be non-corrosive.

Thickness: 1/2 inch nominal.

Weight: 4 pounds per square foot nominal.

99-10264C Construction

99-10264C(1) Examination

Prior to installation, verify work of related trades required as indicated is complete to the point where work of the Section may properly commence.

99-10264C(2) Joints

All joints must be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, must be at least equal to that of the panel. Minimum width of reinforcing layer at joint must be 4 inches, 2 inches on each panel or a 2 inch minimum overlap.

99-10264C(3) Application

Panels must be installed in accordance with the manufacturer's printed recommendations and as required by the plans.

Panels must be adhered using an industrial adhesive, mastic, screws or bolts.

Method of application must maintain the bullet resistive rating at junctures with the concrete floor slab, the bullet resistive doorframes, the bullet resistive window frames and all required penetrations.

99-10264D Payment

Not Used

99-10445 SIGNS

99-10445A General

99-10445A(1) Summary

Scope: This work consists of installing signs.

99-10445A(2) Definitions

Not Used

99-10445A(3) Submittals

Product Data: Manufacturer's descriptive data for sign materials, graphics, and fastening hardware must be submitted.

Manufacturer's standard color palette for acrylic signs must be submitted. The Engineer will select background and character colors from the standard color palette.

Certificate of Compliance: Submit a certificate of compliance for the sheet aluminum.

99-10445A(4) Quality Control and Assurance

Regulatory Requirements: Identification, directional, informational, exit, and accessibility signs and symbols must comply with the Identification symbols, 24 CA Code of Regs Pt 2, 2019 CBC 11B-703 "Signs."

99-10445B Materials

Sign Colors: The color white must comply with FED-STD-595, Color No. 17886. The color blue must comply with FED-STD-595, Color No. 15090. The color black must comply with FED-STD-595, Color No. 17038.

Signs:

Signs must be scratch resistant, non-static, fire retardant, washable acrylic laminate with a non-glare surface, not less than 1/8-inch thick.

International symbol of accessibility entrance sign may be a pressure sensitive decal.

Symbols: Symbols must be scratch resistant, non-static, fire retardant, washable acrylic. Symbol colors must be in contrast to door color.

Fastening Hardware and Material: Fastening hardware and material must be as recommended by the sign manufacturer. Fasteners must be noncorrosive.

99-10445C Construction

Signs and symbols must be fastened or secured to clean, finished surfaces under the sign manufacturer's instructions. Signs must be installed at a location and height as shown.

Metal signs must be attached securely with galvanized or cadmium plated fasteners.

99-10445D Payment

Not Used

99-10522 FIRE EXTINGUISHERS

99-10522A General

99-10522A(1) Summary

Scope: This work consists of installing fire extinguishers with mounting brackets.

99-10522A(2) References

Fire Extinguishers must comply with the requirements in California Code of Regulations, Title 19 Division 1, Chapter 3, "Portable Fire Extinguishers."

99-10522A(3) Definitions

Not Used

99-10522A(4) Submittals

Product Data: Manufacturer's descriptive data and installation instructions must be submitted.

99-10522A(5) Quality Control and Assurance

Codes and Standards: Fire extinguishers must be Underwriters Laboratories or Factory Mutual Laboratories approved for the type, rating, and classification of extinguisher specified.

99-10522B Materials

99-10522B(1) Manufacturers

Acceptable Manufacturers: Manufacturers must be J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or equal.

99-10522B(2) Components

Fire Extinguisher:

Fire extinguisher must be fully charged, multi-purpose dry chemical type, with charge indicator, hose and nozzle, and attached service record tag. Fire extinguisher must be of the capacity and type rating described.

Fire Extinguishers to be type 2A10BC. Install at new and existing modular buildings.

Mounting Bracket: Mounting bracket must be the manufacturer's standard painted, surface mounted type.

99-10522C Construction

99-10522C(1) Installation

Fire extinguishers must be installed in locations and at mounting heights shown, or if not shown, at a height of 48 inches from the finished floor to the top of the fire extinguisher.

Fire extinguisher mounting brackets and cabinets must be attached to structure, square and plumb, under the manufacturer's instructions.

99-10522C(2) Identification

Bracket-mounted: Extinguishers must be identified with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style, and location as selected by the Engineer.

99-10522C(3) Servicing

Fire extinguishers must be serviced, charged, and tagged not more than 5 days prior to contract acceptance.

99-10522D Payment

Not Used

99-10802 TOILET ROOM ACCESSORIES

99-10802A General

99-10802A(1) Summary

Scope: This work consists of installing toilet room accessories.

99-10802A(2) Definitions

Not Used

99-10802A(3) Submittals

Product Data: Manufacturer's descriptive data, installation instructions, and details must be submitted.

Certificates of Compliance: Submit a certificate of compliance for grab bars. Certificates of compliance must include written confirmation that the grab bars, backing, mounting devices, fasteners and their installation comply with the requirements in Structural strength, 24 CA Code of Regs Pt 2 2019 CBC 11B-609 "Grab Bars".

99-10802A(4) Quality Control and Assurance

Regulatory Requirements: Accessibility products must conform to 24 CA Code of Regs Pt 2, 2019 CBC 11B-601 through 11B-610. Grab bars must comply with 24 CA Code of Regs Pt 2, 2019 CBC 11B-604 and 11B-609.

99-10802B Materials

Toilet Tissue Dispenser: Toilet tissue dispenser must be dual roll, surface mounted, lockable, stainless steel with satin finish, and approximately 6" x 11-1/2" x 6" in size. Dispenser must utilize standard toilet tissue rolls. The top roll must automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

Waste Receptacle: Waste receptacle must be surface mounted, stainless steel waste receptacle with satin finish, all welded construction, seamless corners, and approximately 15 inches wide. Waste container capacity must have a capacity of at least 30 gallons. Waste container must have a removable receptacle equipped with liner hooks, reusable vinyl liner, and tumbler lock. One waste receptacle per lavatory.

Soap Dispenser System: Soap dispenser system must be wall-mounted and must have multiple, gravity feed, plunger type dispensing valves, and a remote stainless steel liquid soap reservoir equipped with soap level indicator, outlet valves, and brass tubing and fittings. Brass tubing and fittings must be as recommended by the dispenser manufacturer. Dispensing valves must be stainless steel and chrome plated brass construction and capable of delivering fixed amounts of liquid soap in lather form. The valves must be vandal resistant and project not more than 3 1/2 inches from the wall and must not be removable from within the restroom. Maximum operating force must be 5 pounds. One system per toilet room, and one dispensing valve per lavatory.

Toilet Seat Cover Dispenser: Toilet seat cover dispenser must be surface mounted, stainless steel with satin finish, and approximately 15" x 11-1/2" x 2" in size. One dispenser per toilet stall and wheelchair accessible compartment.

Napkin Receptacle: Napkin receptacle must be surface mounted, stainless steel with satin finish, hinged top and bottom, and have approximately one gallon capacity container with disposable liner. One receptacle per women's toilet stall.

Mirror, Wall Hung: Mirror, wall hung must be Number 1 quality, 1/4-inch thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror must have a heavy gage galvanized steel back and stainless steel frame. The frame must have a satin finish and must be mitered and welded and the corners must be ground smooth. Fasteners must not penetrate surfaces of the frame exposed to view. Mirror must be guaranteed against silver spoilage for not less than 10 years. One mirror per lavatory.

Grab Bar: Grab bar must be stainless steel with satin finish, and concealed, integral mounting flanges.

Clothes Hook: Clothes hook must be stainless steel with two prongs. Quantity must be as shown.

99-10802C Construction

Toilet room accessories must be installed under the manufacturer's instructions. Fasteners for mounting toilet room accessories must be concealed and vandal resistant.

Toilet room accessories must be mounted after painting work has been completed.

All toilet room accessories must be mounted plumb, secure, and rigid.

Grab bars and their fasteners must be installed under the requirements in Grab bars, tub and shower seats, 24 CA Code of Regs Pt 2 2019 CBC 11B-604 and 11B-609.

99-10802D Payment

Not Used

99-11 EQUIPMENT (Not Used)

99-12 FURNISHINGS (Not Used)

99-13 SPECIAL CONSTRUCTION

99-133210 - MODULAR BUILDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope: This work consists of a factory-made, 12' by 21', wood framed manufactured building.
- B. Building Construction Type: CBC Type V-B for Occupancy Classification Group B.
- C. The factory-made building is ready for installation on manufactured provided floor skids to be anchored.

1.2 ADMINISTRATIVE REQUIREMENT

- A. Manufactured building must be constructed in a factory in full compliance with the National Manufactured Home Construction and Safety Standards of HUD (Department of Housing and Urban Development) and HCD (California Department of Housing and Community Development).
- B. Manufacturer must furnish a project manager to follow the project from order to delivery.
- C. You must ensure that utility connections are achieved in an orderly and correct manner for immediate connection of factory-made manufactured building upon delivery and approved by the Engineer.

1.3 REFERENCE STANDARDS

- A. California Department of Housing and Community Development (HCD) approved Commercial Modular Buildings.
- B. California Code of Regulations Title 24: Part 2 "California Building Code", Part 3 "California Electrical Code", Part 4 "California Mechanical Code", Part 5 "California Plumbing Code", and Part 6 "California Energy Code."
 - 1. Materials and Construction Methods for Exterior Wildfire Exposure: Building exterior materials must meet requirements of Chapter 7A of California Code of Regulations Title 24: Part 2 "California Building Code".
 - 2. Standards of Quality: Exterior finish materials must meet testing standards of 703A.7 of California Code of Regulations Title 24: Part 2 "California Building Code" Chapter 7A.
- C. California Code of Regulations Title 25: Division 1, Chapter 3, Subchapter 2, Article 3 "Commercial Modular."
- D. Code of Federal Regulations Title 28, Chapter 1, Part 36 "Nondiscrimination of the Basic of Disability by Public Accommodations and in Commercial Facilities."

- E. Code of Federal Regulations Title 36, Chapter XI, Part 1191 "Americans with Disabilities Act Accessibility Guideline for Buildings and Facilities; Architectural Barrier Act Accessibility Guidelines."
- F. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings.
- G. The Engineered Wood Association (formally American Plywood Association, APA): Voluntary Product Standard PS1-09 Structural Plywood.
- H. American Lumber Standard Committee (ALSC): American Softwood Lumber Standard (Voluntary Product Standard PS 20-15).
- I. American Wood Protection Association (AWPA): AWPA U1-16 Standard.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Job site.
 - 1. Review methods and procedures related to manufactured building including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

1.5 SUBMITTALS

- A. Product Data: For each type of manufactured building component.
 - 1. Include construction details, material descriptions, testing standards, dimensions of individual components and profiles, and finishes for the following:
 - a. Color Chips: Exterior and interior paint, including colors on each item, type of paints and paint manufactures.
 - b. Roofing Manufacturer: Profile, gage, colors and fasteners system and perimeter trim.
 - c. Siding Manufacturer: Profile, material, thickness, colors and fasteners system.
 - d. Trim: Exterior and interior materials, profile size, and thickness, fasteners and finish.
 - e. Underlayment: For roof, walls and floor.
 - f. Light Fixtures: Manufacturer's catalog information, including appearance and electrical characteristics.
 - g. Windows, Doors and Hardware: Catalog cuts showing materials, function and appearance including ADA access as shown.
 - h. Interior Ceilings and Walls: Materials, thickness and finish colors.
 - i. Interior floor finishes: Vinyl composition tile flooring.
 - j. Toilet accessories.
 - k. Signage.
 - l. Structural System: Code compliance and material used.
 - m. Mechanical and Plumbing System: Code compliance and manufacturer catalog.
 - n. Electrical System: Code compliance and material used.
 - o. Ramp and Steps: Code compliance, material and colors.
- B. Shop Drawings: Custom floor plans, reflected ceiling plan, roof plan, elevations using custom elevations, foundation plans and anchor details drawings showing custom features. You must coordinate with the Manufacturer and the Engineer for location of all utility connection and anchor bolt locations. Include the following:

1. Entry Door: Hinges, key locks, weather stripping and thresholds as recommend by door manufacturer in compliant to ADA.
2. Exterior Door Hardware and Keying.
3. Interior Door Hardware.
4. Heat Pump (Wall Mounted).
5. Plumbing System: Water closet, lavatory, electric tankless water heater, floor drain, trap primer, water hammer arrestor, water and sanitary sewer lines layout with sizes and integration into water storage and sewage holding tank systems.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as civil engineer in the State. The expiration date of the registration must be shown.

C. Manufacturer Qualification Statement.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer specializing in manufacturing products specified in this section, with not less than three years of documented experience and have a state license from California Department of Housing and Community Development (HCD) for Commercial Modular Construction.
- B. Certification: Manufactured building must bear the Insignia of Approval issued by HCD-approved Factory-built housing (FBH) Quality Assurance Agency on the exterior of each transportable section prior to shipment.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. The manufactured building must be transported and handled in such a manner as to prevent damage due to twisting, distortion or deformation. Building must be stored off the ground.

1.8 WARRANTY

- A. Manufacturer's Warranty: Limited material and workmanship warranty two years from date of delivery including correcting defective structural system, plumbing, heating, electrical system and appliances at no cost to the Department.

PART 2 - PRODUCTS

2.1 FOUNDATION

- A. Steel Pier Foundation Assembly:
 1. Pressured Treated Wood Pad: Manufacturer standard wood pad approved by HCD, minimum 2 inches thick, treated for ground contact, maximum 2 stacked and fasten with corrosion resistant nails. Cut ends must be field treated. Do not use any 2 inches thick piece of wood with split penetration greater than 4 inches into the end of the piece and parallel to the edges of the piece.
 2. Seismic Steel Pier: Manufacturer standard powder coated steel piers approved by the HCD.
- B. Auger-Type Ground Anchor: The anchors must be attached to the building frame I-beams by steel strip spaced and anchored into the ground according to manufacturer's recommendation.

2.2 PERFORMANCE REQUIREMENTS

- A. Design Criteria: Manufactured building must be constructed in a factory in full compliance with the Manufactured Home Construction and Safety Standards of HUD (Department of Housing and Urban Development).
 1. Design Loads:
 - a. Live:
 - 1) Roof = 20 psf
 - 2) Floor = 125 psf

- b. Wind:
 - 1) Risk Category = II
 - 2) Ultimate Wind Speed = 95 mph
 - 3) Exposure C
 - 4) Analysis Procedure: Implied $q_hGC_f = 25$ psf

- c. Seismic: Manufactured building must withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1) Importance Factor = 1.0
 - 2. Site Class = D
 - 3) Spectral Response Accelerations:
 - a) $S_s = 1.875$
 - b) $S_1 = 0.706$

 - 4) Spectral Response Coefficients:
 - a) $S_{DS} = 1.25$
 - b) 0.800

 - 5) Design Category = D
 - 6. Risk Category = II
 - 7) Analysis Procedure: Equivalent lateral force

- 2. California Climate Zone = 9

2.3 PRE-FABRICATED SYSTEM

- A. Color: To be selected by the Engineer from standard color range of manufacturer.

- B. Wood Construction Requirements:
 - 1. Wood Construction Materials: Comply with the following standards.
 - a. APA PS 1-09: Structural Plywood.
 - b. ALSC PS 20-15: American Softwood Lumber Standard.

 - 2. Wood Treatment where calls for all applicable Codes:
 - a. Treated Lumber & Plywood: Comply with requirements of AWPA U1-16. Use Category System for Wood Treatment determined by use categories, expected service conditions and specific applications.

- C. Chassis: Outrigger style chassis with axles and detachable hitch.

- D. Floor Construction:
 - 1. 12" Outrigger frame with cross members.
 - 2. R-25 Un-faced fiberglass insulation.
 - 3. Reinforced plastic bottom board weather/rodent barrier.

- E. Floor Finish:
 - 1. Vinyl composition tile with resilient base.
 - a. Comply with the requirements of Section 99-09661 Vinyl Composition Tile.
 - 2. Resilient Base
 - a. Comply with the requirements of Section 99-09659 Resilient Base.

- F. Wall Construction:
 - 1. Exterior Walls:

- a. R-21 faced fiberglass insulation.
- b. 5/8" Dens-glass structural sheathing.
- c. Water resistive building wrap over sheathing.

2. Interior Walls:

- a. R-15 un-faced fiberglass insulation.
- b. 5/8" gypsum board.
- c. Low VOC paint as required by code.
- d. 1/8" white FRP at 48-inch wainscot at restroom.

3. Exterior Finish:

- a. 5/16" Noncombustible primed fiber cement panel siding 8" groove.
- b. 7/16" Textured wood trim @ top, bottom, windows, doors, vertical corners as shown.
- c. Building skirt on all 4-sides matching wall sidings.
- d. Siding must meet SFM Standard 12-7A-1 and conform to CBC Chapter 7A.

G. Roof Construction:

1. Roof Slope: 1/2 to 12 minimum.
2. 2x Tapered sleeper rafter.
3. 15# ASTM rated roofing felt.
4. R-38 Un-faced fiberglass insulation.
5. 24 Gage high rib steel roof panel and trim rated for 95 mph hold down ability.
6. Roof must be Class-A rated and conform to CBC Chapters 7A and 15.
7. Full length ridge ventilating system.
8. Gutters: Aluminum J-Rail along length with site install aluminum gutters with leaf guards to prevent accumulation of leaves and debris.
9. All field screws must be sealed with one-part urethane caulking.

H. Ceiling Finishes:

1. Gypsum Board Ceilings
 - a. 5/8" gypsum board.

I. Cabinetry

1. Work Counter: Full length of control booth, reinforced; with drawers below counter and access opening for electrical cords as indicated on the drawings.
 - 1.1 Material: 1/2-inch-thick particleboard with plastic-laminate finish.
 - 1.2. Depth: 24 inches.
 - 1.3. Configuration: As indicated on the drawings.
2. Drawer Slides:
 - 2.1 Drawer slides must be side mounting full extension with fully enclosed rolling balls and rollers, concealed slides and bearings, and positive stop. Capacity must be not less than 75 pounds, except capacity must be not less than 100 pounds for heavy duty drawers.
3. Cabinet Pulls
 - 3.1 Cabinet pulls must be 5/16-inch diameter rod, with 1 5/16-inch projection and 4-inch center to center fastening.
 - 3.2 Cabinet pull manufacturers must be Stanley, Hager, McKinney, or equal.
4. Grommets for Cable Passage

- 4.1 2-inch outside diameter, molded plastic grommets and plastic caps with slots for wire passage.
- 4.2 Place 6-inches away from wall and spaced at 24-inches center to center.

J. Exterior Doors:

1. Door
 - a. Bullet resistant solid core wood door must be of the "non-ricochet type" complete with wood veneer or plastic laminate finish. All wood veneer and/or plastic laminates must have a phenolic backer. Door unit must be supplied pre-hung with a Continuous Gear Hinge and hung in a steel or aluminum ballistic capture frame system.
 - b. Door must be Level-3 bullet resistant rated.
 - c. Door must be minimum 20-minute fire rated and labeled accordingly.
2. Frame
 - a. Frames must provide equal UL protection level as door, non-ricochet type, 16 gage commercial steel or aluminum ballistic frame. Steel to be free of scale, pitting, coil breaks or other surface defects. Frames must be welded and ground flush. Standard tolerances must be +/- 1/16 inch for frame opening width, height, and diagonal. Steel must be primed and painted.
 - b. Door frame must be minimum 20-minute fire rated and labeled accordingly.
3. Door Hardware
 - a) See Section 99-08710 Door Hardware.
4. Access Door (crawl space)
 - a) Size: 24-inch by 24-inch.
 - b) Access Doors: Access doors and frames must be factory assembled and factory primed steel. Door panel must be 0.075 inches thick and door frame must be 0.060 inches thick. The door and frame assembly must have standard screw driver operated cam locks, concealed spring hinges or continuous piano hinge and inside release handle.
 - c) Access doors and frames must be painted to match the color of the adjacent surrounding surfaces.

K. Interior Doors:

1. Solid core pre-finished wood grain.
2. 18 Gage prefinished steel frame.
3. Door Hardware
 - a) See Section 99-08710 Door Hardware.

L. Windows:

1. Window Assembly
 - a. Windows must be Commercial Class bronze anodized aluminum prime windows unless otherwise shown. Aluminum must be aluminum alloy 6063-T5 complying with ASTM B 221.
 - b. Windows must comply with AAMA/WDMA/CSA 101/I.S.2/A440 and must meet C30 or CW30 Performance Class and Grade unless otherwise shown. Windows must bear the AAMA label.
 - c. Horizontal Sliding Windows: Horizontal sliding windows must be horizontal slide windows with tightly contacting, weatherstripped, meeting stiles, self-lubricating rollers, glazing accessories, tubular sill, snap locks, and push handle. Vents must be screened.
 - d. Vent Screen: Vent screen must be aluminum frame with 18 by 14 mesh aluminum screening and polyvinyl-chloride splines. Screen frames must be removable from the interior. Screen frame must match window finish.
2. Glazing
 - a. See Section 99-08810 Glazing
3. Blast Resistant Film and Edge Retention System
 - a. Film
 - 1) Film must be composed of multiple microlayers.
 - 2) Film must have a minimum overall thickness of 8 mils or more.

- 3) Film and edge retention system must pass the GSA TS01-2003 and ASTM F1642 testing standards with a condition 2 or better. Test must be based on a minimum of 10 psi. Blast Pressure and 89 psi msec. Blast Impulse.
 - 4) Film must have a scratch resistant inner layer.
 - 5) Film must have a flame spread and smoke development rating of Class A when tested per ASTM E84 standard.
 - 6) Film must have a minimum tensile strength of 27,000 psi. per ASTM D882
 - 7) Film must be clear and must allow a minimum of 86% visible light transmission
 - 8) Film must have a minimum area tear resistance of 1,100 lbs % per ASTM D1004.
 - 9) Film must have a break Strength of 255 lbs/in minimum per ASTM D 882.
 - 10) Film peel strength must be greater than 6 lbs/in per ASTM D3330 (Method A)
 - 11) Film Abrasion Resistance must be less than 3% per ASTM D1044.
- b. Edge Retention system
- 1) Edge Retention must be manufacturer's standard system required to meet performance requirements.
 - 2) System must create a trim connecting the film to the window frame. Exposed mechanical fasteners will not be allowed.
4. Trim: Vinyl covered wood return and casing.
 5. 1" Horizontal vinyl mini blinds.
- M. Mechanical System: Mechanical system must include wall mounted Heat Pump unit, exhaust fan (ceiling mounted) and thermostat.
1. Heat Pump (Wall Mounted): Heat pump must be wall mounted, through-the-wall type with backup electrical resistance heating, rotary type compressor, and must include slide-out chassis design, thermostat, adjustable discharge grilles, multi-speed fan, and integral thermal overload protection. 2 Ton capacity nominal cooling and heating capacity, 23500 BTUH sensible cooling, 10 SEER, 5.5kW electric resistance heating, 600 cfm air flow. Unit must be 230V-1Ph-60HZ.
 2. Ceiling exhaust air fans in restroom, 190 cfm @ 0.25" W.C. SP, 4 sonos, 120V-1Ph-60Hz.
 3. Thermostat: Thermostat must be 24-volt, 7-day programmable, electronic heating/cooling thermostat, with the ability to program the fan-on mode during normal working hours, and fan-off mode during unoccupied periods. Thermostat must be provided with sub-base selector switches for "AUTO- HEAT-OFF-COOL" and fan "AUTO-ON". Thermostat must be auto-changeover type, and have full temperature range setback capacity.
- N. Electrical System:
1. 3 each 125 Amp 1 phase exterior mounted panel with main breaker.
 2. EMT conduit raceway with #12 wire.
 3. Duplex 15 Amp outlets.
 4. Duplex 15 Amp GFCI outlets near plumbing and at HVAC required by code.
 5. Weather proof exterior GFCI outlets.
 6. Floor box quadraplex 15 Amp circuit.
 7. Floor box, 4 port network connector.
 8. 2' by 4' Recessed troffer lighting with LED bulbs.
 9. 30W 2000 lm LED exterior rustproof vandal-resistant lights with photocells.
 10. 2" by 4" J-box with pull string for future phone and data.
 11. 6" by 6" by 6" Telephone/data inlet box with 3/4" conduit and pull string to attic space.
 12. Wall and ceiling mounted occupancy sensors.
 13. Lighting control per CA energy codes.
 14. Dual head exit/emergency light with 90-minute battery backup required by code.
 15. Smoke detector/alarm system with built-in battery backup required by code.
 16. Carbon monoxide detectors.
 17. Lights above ADA compliant mirror.
- O. Plumbing System: Plumbing system must include water closet, lavatory, electric tankless water heater, floor drain, trap primer, water hammer arrestor, water and sanitary sewer pipes and fittings.

1. Water Closet: Water closets must be ADA accessible, low consumption type with 1.28 gpf, floor mounted, vitreous china, siphon jet, elongated bowl, and 1-1/2 inch top spud. Water closets must include the flushometer, grab bars and appurtenances. Flushometer must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 1-1/2 inch top spud water closets. Water closet seat must be a solid plastic, open front, elongated seat with check hinges.
2. Lavatories must be ADA accessible, vitreous china with ledge, grid drain with overflow, and drilled for 4-inch centers. Nominal dimensions must be 20 by 18 inches. Lavatory faucets must be single extra-long lever mixing faucet complying with 24 CA Code of Regs Pt 2 § 1115B.4.3. Lavatory must be equipped with temperature controls to limit the hot water supply to 110 degrees F at a flow rate of no more than 0.5 gpm. Lavatory supports must be concealed type, wall mounted carrier with leveling screws and locking devices. Carriers must be adjustable for type of wall. Include required hardware.
3. Electric tankless water heater, point of use under the sink mounted, 3.5 kW, 120V-1Ph-60Hz.
4. ABS waste lines.
5. Copper waterline.
6. ADA compliant lavatories must be vitreous china with ledge, grid drain with overflow, and drilled for 4-inch centers. Nominal dimensions must be 20 by 18 inches. Lavatory faucets must be single extra-long lever mixing faucet complying with 24 CA Code of Regs Pt 2 § 1115B.4.3.
7. Floor drain: Floor drain must be dura-coated cast iron body and adjustable flashing collar, adjustable nickel bronze 6-inch strainer head with seepage openings and caulk or no-hub outlet.
8. Automatic Trap Primer Valve: Valve must: 1) Be made of cast bronze, 2) Include an integral vacuum breaker, 3) Have a non-liming internal operating assembly with gasketed bronze cover, 4) Have an access panel installed in an accessible location.
9. Water hammer arrestor: Water hammer arrestor must be Type "K" hard-drawn copper body with piston. Arrestor compression chambers must be pneumatically charged. Water hammer arrestors must be tested and certified under the Plumbing and Drainage Institute Standard: PDI-WH201 or ASSE 1010.

P. Miscellaneous Materials:

1. Fasteners: Fasteners for the frame, roof panels, wall panels and accessories must be the building manufacturer's standards and must be the size, type and spacing required by the design.
2. Sealant: Sealant must be a single component complying with ASTM C920. Sealant must be clear, translucent or opaque white.
3. Backer Rod: Backer rod must be round, open cell polyurethane, sized such that it must be compressed between 25 percent and 75 percent of its uncompressed diameter when inserted in the joint.
4. Bituminous Sealant: Bituminous sealant must comply with Federal Specification SS-C-153.
5. Fascia, Trim, Metal Soffit, Coping, Ridge Cover, Gutters, Downspouts, Flashing, Clips and Miscellaneous Support Shapes: All materials must be building manufacturer's standards.
6. Toilet Accessories: Comply with the requirements of Section 99-10802 Toilet Room Accessories.
 - a. Mirror.
 - b. Soap Dispenser.
 - c. Combo paper towel dispenser and waste receptacle.
 - d. Toilet seat cover dispenser.
 - e. Combo toilet tissue dispenser and sanitary napkin disposal.
7. Signage: Comply with Section 99-10445 Signs
 - a. Accessibility.
8. Fire Extinguisher: Comply with Section 99-10522 Fire Extinguishers.

Q. Prefabricated Modular Access System: Comply with the requirements of Section 99-133510.

2.4 FABRICATION

- A. Building frame components must have all the bolt holes necessary for installing, assembling, and fastening made at the factory.
- B. Bolt holes must be either punched full size, drilled full size, sub-punched and reamed, or sub-drilled and reamed. The finished holes must be cylindrical, perpendicular to the plane of the connection, and must be not more than 1/16-inch larger than the nominal diameter of the bolt. Mis-punched or mis-drilled holes must not be corrected by welding unless authorized by the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, utilities connections, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before installation proceeds, survey elevations and locations of anchor rods, bearing plates, and other embedment to receive structural framing, with installer present, for compliance with requirements and manufacturer's tolerances.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Manufacture must clean and prepare building at factory for over the highway transportation to assure damage free transit.
- B. Lock and block all doors and windows for transit.
- C. You must prepare a site plan in preparation for the arrival of the building showing power lines, fire hydrants and site access.
- D. Building Skirt will be furnished and finished by the manufacturer, cut to size and installed by You.

3.3 INSTALLATION

- A. You must coordinate with building manufacturer and furnish a crane or fork-lift intended for the weight of the manufactured building. Manufactured will provide correct minimum lifting capacity and by locating lift points and recommended lifting capacities.
- B. You must coordinate with installer on the exact location and configuration of all utilities to be connected by You.
- C. Install building skirt after Code official's inspection on anchor bolts.
- D. Install each item in accordance with manufacturer's instruction.
- E. You must inspect the condition of structure and components, clean, fix and re-paint as necessary for Department's occupancy.

3.4 CLEANING AND PROTECTION

- A. Exterior, including roof, walls, doors and windows, must be washed and cleaned free of dirt.
- B. Protect installed building from subsequent construction operations.
- C. Traffic over unprotected floor surface is not permitted.

END OF 99-133210

99-133510 - PREFABRICATED MODULAR ACCESS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes prefabricated modular aluminum access ramps, steps, and platform.

1.2 ACTION SUBMITTALS

- A. Product Data. Submit manufacturer's descriptive data and installation instructions.
- B. Shop Drawings: Custom floor plans, roof plan, elevations using custom elevations, foundation plans and anchor details drawings showing custom features. Shop drawings and calculations must be sealed and signed.

Include the following:

1. Include overall layout dimensions.
2. Include footer layout and anchor embedment drawings.
3. Handrailing details.

- C. Color: Manufacturer standard powder coating colors for selection by Engineer.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Manufacturer issued warranty warrants its products to be free from defects in material and workmanship for a period of three years beginning at the date of delivery.
- B. Delegated-Design: Include professional engineer who is licensed in the State, signed and sealed drawings and calculations. The expiration date of the registration must be shown.

1.4 QUALITY ASSURANCE

- A. All components must be designed such that an access system can be repurposed in new configurations and functions. This includes being able to connect all platforms together if a new configuration requires.
- B. All exposed surfaces must be free of sharp or jagged surfaces.
- C. Warranty: Manufacturer warrants its products to be free from defects in manufacturing material and workmanship for a period of three years beginning at date of delivery.
- D. Ramps and steps must comply to Code of Federal Regulations Title 36, Chapter XI, Part 1191 "Americans with Disabilities Act Accessibility Guideline for Buildings and Facilities; Architectural Barrier Act Accessibility Guidelines."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 1. Keep members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 2. Protect members and packaged materials from corrosion and deterioration.
 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. The ramp, steps, and platform system must be designed to be a rigid, free-standing structure. All footplate must be fastened securely to a concrete surface or 12" minimum diameter footing to achieve full structural integrity. Fastening all platforms to the building with lag screws.
- B. The ramp, steps and platform system must be designed to carry a minimum uniform live load of 100 pounds per square foot and a concentrated static vertical load of 300 pounds in an area of one square foot.
- C. Aluminum structural design must conform to the aluminum association specifications and guidelines for aluminum structures.

2.2 MATERIALS

- A. All ramp sections, platforms, steps, legs, and guardrails must be constructed using 6000 series aluminum alloy with 6061-T6, or 6005T5 used for structural components. All components must be mill finish aluminum extrusions with powder coating.
- B. All fasteners must be corrosion resistant.
- C. All ramps, steps, platforms and landings must be designed for variable heights and have a continuous walking surface, without gaps, and must be approximately 1-1/4" by 6" high self-mating aluminum deck with extruded slip resistant surface.

2.3 COMPONENTS

- A. Ramp Sections:
 - 1. Ramp sections must be fabricated in 2-foot, 3-foot, 4-foot, 5-foot and 6-foot lengths and are 48-inch or 54-inch clear width and have a minimum 4-inch curb or barrier.
 - 2. All ramp sections must be designed to for a 1:12 slope when assembled.
- B. Platforms and Landings:
 - 1. Platforms and landings must be prefabricated in typical 65-1/2" square, 77-1/2" square, 65-1/2" by 77-1/2" rectangular or 65-1/2" by 89-1/2" rectangular sections.
- C. Steps:
 - 1. Step risers must be between 7-inch maximum and 4-inch minimum high and must be closed.
 - 2. Step treads must be 11-inch minimum deep by 48-inch minimum wide between handrails, and 53-3/4-inch between siderails.
 - 3. Stair nosing must meet OSHA requirements for anti-slip safety on steps. Color: Safety Yellow.
- D. Legs:
 - 1. The legs must be designed to support the ramp, steps and platform/landing sections.
 - 2. The legs must allow for height and slope adjustments. Legs must be designed so that they will be perpendicular to the ground and vertical loads are transmitted axially through them, regardless of slope.
 - 3. All legs must have through bolted polymer 7-3/8" by 7-3/8" feet.
- E. Handrails and Guards:
 - 1. Handrails and guards must be designed to resist a single concentrated load of 200 pounds applied at any point and in any direction at the top of the handrail or guardrail and to transfer this load through the supports to the structure.

2. Handrails and guards must be designed and constructed to resist a load of 50 pounds per linear foot applied horizontally at the required handrail height and a simultaneous load of 100 pounds per linear foot applied vertically downward at the top of handrail.
3. Guard infill must be designed and constructed to resist a 50-pound horizontal load applied over a one square foot area at any point in the system.
4. Handrail gripping surface must be smooth and continuous throughout ramp sections, steps, and platforms/landings, returning to a guard or wall that is not more than 1/4-inch from the end of the handrail termination.
5. Handrail must be 1-1/2-inch diameter tubing. The top of the handrail must be 36-inch above the walking surface. The height of the handrail above the finish surface must be uniform, not less than 34-inch and not more than 38-inch.
6. Guards must form a protective barrier of minimum 42-inch high at elevation of 30-inch and above. Guards must be designed such that a 4-inch sphere cannot pass through any opening.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING ALUMINUM RAMP SYSTEM

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal steps to in-place construction.
 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal steps. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

3.3 REPAIRS

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF 99-133510

99-14 CONVEYING SYSTEMS (Not Used)

99-15 MECHANICAL

99-15050 MECHANICAL WORK

99-15050A General

99-15050A(1) Summary

Scope: This work consists of performing mechanical work.

Mechanical work must include furnishing all labor, materials, equipment and services required for providing plumbing and water distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work must comply with the requirements described for similar type work elsewhere.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

99-15050A(2) Definitions

Not Used

99-15050A(3) Submittals

Product Data:

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer must be submitted.

Manufacturer's descriptive data must include complete description, performance data, and installation instructions for the materials and equipment described. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout must be included where applicable.

Manufacturer's descriptive data must be submitted for the following:

- Plumbing Products
- Diaphragm Pressure Tank and Pump
- Water Storage Tank
- Sewage Holding Tank
- Pressure Switch
- Relief Valve

99-15050A(4) Closeout Submittals

Operation and Maintenance Manuals:

Prior to the completion of the Contract, submit 3 identified copies of the operation and maintenance instructions with parts lists for the equipment used. The instructions and parts lists must be indexed and bound in a manual form and must be complete and adequate for the equipment installed. Inadequate or incomplete material must be returned. You must resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals must be submitted for the following equipment:

- Diaphragm Pressure Tank
- Pump
- Pressure Switch

99-15050A(5) Quality Control and Assurance

Codes and Standards: Mechanical work, including equipment, materials and installation, must comply with the CBC: CMC; CPC; CEC; and California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

99-15050A(6) Warranty

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work must be delivered to the Engineer at the job site prior to acceptance of the Contract.

99-15050B Materials

Not Used

99-15050C Construction

Not Used

99-15050D Payment

Not Used

99-15060 PIPE, FITTINGS, VALVES

99-15060A General

99-15060A(1) Summary

Scope: This work consists of installing pipes, fittings, and valves. Pipe, fittings, and valves must include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and wrapping material must comply with the requirements under section 99-15250.

The pipe sizes shown are nominal inside diameter. No change in the pipe size shown will be permitted without authorization from the Engineer.

The pipe and fitting classes and material descriptions must be as described. No change in class or description will be permitted without authorization from the Engineer.

99-15060A(2) Definitions

Not Used

99-15060A(3) Submittals

Test Reports: Certified test reports signed by Contractor and supervisor who performed testing work.

99-15060A(4) Quality Control and Assurance

Codes and Standards: Pipe, fittings, and valves must be installed under the CPC, the manufacturer's instructions, and the requirements described herein.

99-15060B Materials

99-15060B(1) Pipe and Fittings (Class and Description)

A1: Schedule 40 galvanized steel pipe complying with ASTM A 53, with 150 psi galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A 53.

A2: Schedule 40 galvanized steel pipe complying with ASTM A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, must be used. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A 53.

H2: Type K hard copper tubing complying with ASTM B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder must be lead-free.

P1: Polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings complying with ASTM D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or complying with ASTM D2665 with solvent welded fittings. Rubber gaskets must comply with ASTM F 477. Stainless steel clamps with rubber boots must not be used.

Unions (for Steel Pipe): Unions (for steel pipe) must be 250 psi, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Unions (for Copper or Brass Pipe): Unions (for copper or brass pipe) must be 150 psi cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 125 psi cast brass, ground joint, brass to brass seat with threaded ends.

Unions (for Brass Waste and Flush Pipes): Unions (for brass waste and flush pipes) must be slip or flange joint unions with soft rubber or leather gaskets. Unions must be placed on the fixture side of the traps.

Dielectric Waterway: Dielectric waterway must be a premanufactured unit that incorporates an insulated interior lining at least 3 inches in length between the 2 pipes being connected while maintaining metal to

metal contact on the exterior surface. Dielectric water way must be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating Union: Insulating union or flange as applicable must be suitable for the service on which used. Connections must be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings must not be used. Insulating union must be F. H. Maloney; Central Plastics; EPCO; or equal.

99-15060B(2) Valves

Gate Valve (2½-inch and smaller):

Gate valve (2½-inch and smaller) must be bronze body and trim, removable bonnet and non rising stem, threaded ends, Class 125 and same size as pipe in which installed. Gate valve must be Crane, 438; Nibco, T-113; Jenkins, 310J; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve must be Crane, 1330; Nibco, S-111; Jenkins, 452J; or equal.

Ball Valve: Ball valve must be two piece, minimum 400 psi WOG, bronze body and chrome plated or brass ball with full size port, threaded ends. Valve must be Nibco, T-580; Watts, B-6000; Kitz, 58; or equal.

Check Valve (1½-inch and smaller): Check valve (1½-inch and smaller) must be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve must be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

99-15060B(3) Faucets and Hydrants

Hose Faucet: Hose faucet must be compression type, angle pattern, wall flange at exterior locations, box and stop at interior locations, tee handle, ¾-inch female thread with hose end, chrome finish for locations inside building, rough brass finish for others. Hose faucet must be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet must be Nibco; Chicago; or equal.

99-15060B(4) Cleanouts

Cleanout Through Wall: Cleanout through wall must be cast iron cleanout tee type with polished stainless access plates. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout in exterior locations must be heavy duty, floating pipe type with cast iron cover. Cleanouts must be Wade, No. 6000 TY; Smith, No. 4231; Zurn, No. 1474; or equal.

99-15060B(5) Miscellaneous Items

Diaphragm Pressure Tank and Pump: Diaphragm pressure tank and pump must be an integral unit with a differential pressure switch. The switch must have an adjustable differential range and be factory set to energize and deenergize the pump according to the values indicated on the plans. Diaphragm pressure tank must meet FDA requirements for potable water usage.

Pressure tank must be a pressurized diaphragm type, hydropneumatic tank. The tank must be free standing, set between 40 to 60 PSI working pressure, constructed of heavy gage steel, stainless steel system connection, stainless steel air valve stem, polypropylene lined with a bladder diaphragm. The tank must be equipped with a pressure gage, gage cock and air charging valve. Bladder diaphragm must be a heavy gage material which does not impart taste or odor, will not absorb water and meets FDA requirements for potable water usage. The tank capacity must be as shown on the plans. The exterior surfaces of the tank must be factory primed and painted.

Pump must be a closed-coupled, bronze fitted, single stage horizontal centrifugal pump with mechanical seal and ball or roller bearings. Pump case must be closed grained, high strength cast iron with bronze wear ring. Pump shaft must be stainless steel. Impeller must be bronze or stainless steel and certified dynamically balanced and must meet FDA requirements for potable water usage.

Pump must be capable of pumping water, under test, at the flow rates and total heads shown on the plans. The pump, as installed must not load the motor beyond the nameplate rating.

The pump motor must be totally enclosed fan cooled motor. Single-phase motor must be capacitor type. Horsepower, voltage, phase and RPM must be as shown on the plans.

Relief Valve: Relief valve must be spring loaded adjustable with a maximum working pressure of 100 psi. Relief valve must be constructed of stainless steel or brass and must be of the size shown on the plans.

Water Storage Tank: Water storage tank must be a black plastic vertical storage tank constructed with rotationally molded polyethylene resin, must have tie downs to secure to cement slab. The water storage tank must be equipped with a 16" threaded vented manway, 2" polypropylene female npt bulkhead fitting outlet and a float switch wired between the controller and indicator to control the pump and indicate when the tank is close to being empty. Water storage tank must meet FDA requirement for potable water usage.

Sewage Holding Tank: Sewage holding tank must be above ground tank, low profile, design for outdoor use to resist hot and cold weather conditions, constructed of polyethylene material. The sewage holding tank must be of the size shown on the plans. The sewage holding tank must be equipped with a float switch wired between the controller and indicator to control the pump and indicate when the tank is at full capacity.

Sequence of Operation: Pressure switch must be adjusted by turning the larger nut clockwise to raise the factory setting from 30/50 psi to 40/60 psi. A full rotation of the nut with spring will adjust the pressure between 2-3 psi. Turning the nut counterclockwise can also lower the pressure if the pressure settings are set at 50/70 psi. When the pressure inside the diaphragm pressure tank lowers to 40 psi at the cut on pressure, the pump will turn on until the pressure inside the diaphragm tank reaches to 60 psi at the cut off pressure setting. Turning the smaller nut can also adjust the differential pressure between 2-3 psi on a full rotation and will only adjust the cut off pressure of the system. The float switch (FS1) inside the water storage tank can shut off or de-energize the pump if the water inside the water storage tank reaches the elevation that is shown on the plans, the pump will automatically turn off and will not turn on even if the pressure on the diaphragm reaches the cut on pressure. The float switch (FS2) inside the sewage holding tank can also shut off or de-energize the pump if the wastewater inside the tank reaches the elevation that is shown on the plans, the pump will automatically shut off and will not turn on even if the diaphragm pressure tank reaches the cut on pressure.

Compression Stop (Exposed): Compression stop (exposed) must be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Pressure Gages : Pressure gages must have 0 to 100 psi scale with 3½-inch minimum diameter dial. Pressure gages must be provided with a brass gage cock.

Wye Strainer: Wye strainer must be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen must have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and must be woven wire fabric with 20 mesh or perforated sheet with 0.032-inch maximum diameter holes.

Pipe Hanger (for piping supported from overhead): Pipe hanger (for piping supported from overhead) must be Anvil International, Model RH260; Super Struct, C711; or equal.

Pipe Wrapping Tape and Primer:

Pipe wrapping tape must be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 20 mils. Wrapping tape must be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer must be compatible with the pipe wrapping tape used.

Floor, Wall, and Ceiling Plates: Floor, wall, and ceiling plates must be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates must be sized to completely cover the hole.

Sealants: Provide sealant for pipe installation that is:

1. One component
2. Low modulus
3. Non-acid curing
4. Compliant with ASTM C 920
5. Tack-free in one hour
6. Not subject to sag or flow
7. Capable of 100 percent extension and 50 percent contraction without failure

99-15060C Construction

99-15060C(1) Installation of Pipes and Fittings

Pipe and Fittings: Pipe and fittings must be installed under the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water within 5 feet of the building	A1 or H2
Domestic water 5 feet beyond the building	A1 or H2
Sanitary drain within 5 feet of the building	P1
Sanitary vent piping above ground	A2,
Sanitary drain pipe, 5 feet beyond the building	P1

Installing Piping:

Water piping must be installed generally level, free of traps and bends, and arranged to comply with the building requirements.

Piping installed underground must be tested as described elsewhere in these special provisions before backfilling.

Where pipes pass through exterior walls, a clear space around pipe must be provided. Space must be caulked water tight with silicone sealant.

Forty-five degree bends must be used where offsets are required in venting. Vent pipe headers must be sloped to eliminate any water or condensation.

Vent piping must extend a minimum of 8 inches above the roof.

Horizontal sanitary sewer pipe inside buildings must be installed on a uniform grade of not less than ¼ inch per foot unless otherwise shown.

Drainage pipe must be run as straight as possible and must have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends must be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Water pipe near sewers:

Water pipe must not be installed below sewer pipe at any crossing, or below sewer pipe in parallel,

When a water pipe crosses above a sewer pipe, a vertical separation of at least 12 inches between the top of the sewer and the bottom of the water pipe must be maintained.

Cutting Pipe: Pipe must be cut straight and true and the ends must be reamed to the full inside diameter of the pipe after cutting.

Damaged Pipe: Pipe that is cracked, bent or otherwise damaged must be removed from the work.

Pipe Joints and Connections:

Joints in threaded steel pipe must be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints must be made tight. Long screw or other packed joints will not be permitted. Any leaky joints must be remade with new material.

Exposed polished or enameled connections to equipment must be made with special care, showing no tool marks or threads.

Cleaning and Closing Pipe: The interior of all pipe must be cleaned before installation. All openings must be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs must remain in place until their removal is necessary for completion of the installation.

Securing Pipe: Pipe in the buildings must be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports must be compatible with the piping or neoprene isolators must be used. Allowances must be made for expansion and contraction. Steel pipe must have hangers or supports every 10 feet. Copper pipe one inch or less in diameter smaller must have hangers or supports every 6 feet and sizes larger than one inch must have hangers or supports every 10 feet. Plastic pipe must have hangers or supports every 3 feet. Cast iron soil pipe with neoprene gaskets must be supported at each joint. Vertical pipes must be supported with clamps or straps. Horizontal and vertical piping must be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and Supports:

Hangers and supports must be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports must be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports must be sized to fit the outside diameter of pipe or pipe insulation. Hangers must be removable from around pipe and must have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place must be compatible with piping material.

Hanger rods must be provided with locknuts at all threaded connections. Hanger rods must be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
1/2" to 2"	3/8"
2 1/2" to 3 1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

Wrapping and Coating Steel Pipe:

Steel pipe buried in the ground must be wrapped or must be plastic coated as specified herein:

1. Wrapped steel pipe must be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes must be tightly applied with 1/2 uniform lap, free from wrinkles and voids with authorized wrapping machines and experienced operators to provide not less than 40-mil thickness.
3. Plastic coating on steel pipe must be factory applied. Coating imperfections and damage must be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe must be covered to provide continuous protection by puttying and double wrapping with 20-mil thick tape. Wrapping at joints must extend a minimum of 6 inches over the adjacent pipe covering. Width of tape for wrapping fittings must not exceed 2 inches. Adequate tension must be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds authorized by

the Engineer must be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and filed joints must be authorized by the Engineer after assembly. Piping must be placed on temporary blocks to allow for inspection. Deficiencies must be repaired to the satisfaction of the Engineer before backfilling or closing in.

Union: Unions must be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions must be located so piping can be easily disconnected for removal of equipment or tanks. Unions must be omitted at compression stops.

Dielectric Waterway: Dielectric waterway must be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Insulating Union and Insulating Connection:

Insulating union and insulating connection must be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections must be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.
4. At each end of buried ferrous pipe protected by cathodic protection.

Bonding at Insulating Connections: Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections must be bonded under the CEC. Bonding must all be coordinated with electrical work.

Compression Stop: Each fixture, including hose faucets, must be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown or otherwise authorized by the Engineer.

99-15060C(2) INSTALLATION OF VALVES

Not Used

99-15060C(3) INSTALLATION OF FAUCETS AND HYDRANTS

Hose Faucet and Hydrants: Faucets and hydrants must be installed with outlets 18 inches above finished grade.

99-15060C(4) INSTALLATION OF CLEANOUTS

Cleanouts:

Cast iron soil pipe (C1 or C2) and fittings must be used from Wye to surface. Required clearance around cleanouts must be maintained.

99-15060C(5) INSTALLATION OF MISCELLANEOUS ITEMS

Flushing Completed Systems: All completed systems must be flushed and blown out.

Potable Water Piping: Clean and flush domestic water systems with potable supply water. Continue to flush until potable water is maintained throughout entire system.

Drainage and Vent System: Clean and flush with potable supply water until free of all foreign matter.

Chlorination:

You must flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, must not be applied in the dry form, but must first be dissolved into a solution before application.

You must take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings must be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system must be opened and water run to waste until a strong chlorine test is obtained. The line must then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line must contain no less than 25 ppm chlorine throughout. After the retention period, the system must be drained, flushed and refilled with fresh water.

99-15060C(6) FIELD QUALITY CONTROL

Testing:

You must test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system must be tested as a single unit, or in sections as authorized by the Engineer. You must furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, you must repair all leaks and retest to determine that leaks have been stopped. Surplus water must be disposed of after testing as directed by the Engineer.

You must take precautions to prevent joints from drawing while pipes and appurtenances are being tested. You must repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

Cathodic Protection Tests: The State will conduct tests at locations where cathodic protection is required to determine compliance with the specified requirements.

General Tests:

All piping must be tested after assembly and prior to pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems must show no loss in pressure or visible leaks.

You must test systems under the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	10-foot head	Water
Water	125 psig	Water

During testing of water systems, valves must be closed and pipeline filled with water. Provisions must be made for release of air.

Sanitary sewers must be cleared of obstructions before testing for leakage. The pipe must be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug must be moved slowly through the pipe with a tag line. You must remove or repair any obstructions or irregularities.

Sanitary sewer pipes beyond 5 feet perpendicular to the building must be tested for leakage for a period of not less than 4 hours by filling with water to an elevation of 4 feet above average invert of sewer or to top of manholes where less than 4 feet deep. The system must show no visible leaks. The sewer may be tested in sections with testing water progressively passed down the sewer as feasible. Water must be released at a rate that will not create water hammer or surge in plugged sections of sewer.

Test Procedures:

Rough Plumbing (Soil, Waste, and Vent): Verify piping materials and test upon completion of rough piping installation to ensure watertight system.

Water Test: Apply water test to drainage system in its entirety or in sections after rough piping is installed. If applied to the complete system, tightly close each opening in piping, except highest opening, and fill with water to the point of overflow. If the system is tested in sections, tightly plug each opening except the highest opening of the section under test, and fill with water.

1. Do not test a section with less than 10 feet head of water.
2. In testing successive sections, test at least the upper 10 feet of the following section so that each joint or pipe in the building, except the uppermost 10 feet of the system, is subjected to a test with more than a 10 foot head of water.
3. Keep water in system or in the portion under test for at least 15 minutes prior to inspection; the system must be tight at each point.

Sanitary Systems: After plumbing fixtures and floor drains are set and traps filled with water, verify drainage system materials and test. Ensure that system is gas tight by a smoke test or peppermint test.

Water Systems: When roughing in is completed and before fixtures are set, test cold water piping systems at hydrostatic pressure of 150 psi for at least 4 hours to permit inspection of each joint. Where a portion of water piping system is concealed before completion, test portion separately the same as specified for system.

Exceptions: Exclude equipment and accessories which may be damaged if subjected to full test pressure.

99-15060D Payment

Not Used

99-16 ELECTRICAL

99-16010 ELECTRICAL WORK

99-16010A General

99-16010A(1) Summary

Scope: This work consists of performing electrical work including furnishing all labor, materials, equipment and services required to construct, connect and install the complete electrical system.

99-16010A(2) System Description

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and must be coordinated with the work of other trades. Equipment requiring maintenance and inspection must be located where it is readily accessible for the performance of such maintenance and inspection.

99-16010A(3) Definitions

Not Used

99-16010A(4) Submittals

Not Used

99-16010A(5) Quality Control and Assurance

Regulatory Requirements: All electrical work performed and materials installed must comply with section 86-1.01D(1) and 24 CA Code of Regs, Part 6, "California Energy Code."

99-16010B Materials

Not Used

99-16010C Construction**99-16010C(1) General**

Not Used

99-16010C(2) Testing

After the installation work for the various systems has been completed, each electrical system must be tested in the presence of the Engineer to demonstrate that the electrical systems function properly. Make necessary repairs, replacements, adjustments and retests at your expense.

Final inspection for the completed electrical system will take place after all the various systems have been tested.

The Engineer must be notified 15 days in advance of testing and State personnel training on the job site. When the Department's Electrical Engineer is required on the job site, the Engineer must be notified 15 days in advance.

99-16010D Payment

Not Used

99-16050 BASIC MATERIALS AND METHODS**99-16050A General****99-16050A(1) Summary**

Scope: This work consists of furnishing and installing the basic materials for the electrical work, including conduits, conductors, fittings, and wiring devices. The basic materials must include those accessories and appurtenances, not mentioned, that are required for the installation and operation of the electrical system.

99-16050A(2) Definitions

Not Used

99-16050A(3) Submittals

Product Data:

Submit a list of all materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include catalog cuts, complete description, performance data and installation instructions for the materials and equipment.

99-16050A(4) Quality Control and Assurance**99-16050B Materials****99-16050B(1) Conduits and Fittings**

Rigid Steel Conduit and Fittings: Rigid steel conduit and fittings must be Type 1 complying with section 86-1.02B(1).

PVC Coated Rigid Steel Conduit and Fittings: PVC coated rigid steel conduit and fittings must be Type 2 complying with section 86-1.02B(1).

Electrical Metallic Tubing (EMT) and Fittings:

EMT must be formed of cold rolled strip steel, zinc coated, and interior lined to comply with UL Standard 797 and ANSI C 80.3.

Couplings must be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors must be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated thermoplastic throat.

Flexible Metallic Conduit and Fittings:

Flexible metallic conduit must be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings must be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Rigid Non-Metallic Conduit and Fittings: Rigid non-metallic conduit and fittings must be Type 3 complying with section 86-1.02B(1).

Liquidtight Flexible Metallic Conduit and Fittings: Liquidtight flexible metallic conduit and fittings must be Type 4 complying with section 86-1.02B(1).

99-16050B(2) Cables and Conductors

Conductors:

Conductors must be stranded copper wire of the size shown. Conductors must comply with ASTM B3 and ASTM B8. Conductor size must be based on AWG, except that conductor diameter must be not less than 98 percent of the specified AWG diameter.

Conductor insulation types must be as follows:

1. Conductors in control panel enclosures must be Type MTW.
2. Conductors in wet, underground, or outdoor locations must be Type XHHW-2.
3. All conductors other than Type MTW and XHHW-2 must be Type THHN.

Wire Connections and Devices: Wire connections and devices must be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

99-16050B(3) Electrical Boxes

Outlet, Device and Junction Boxes:

Boxes must be galvanized steel boxes with knock-outs and must be the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches square by 1-1/2 inches deep. Flush-mounted single device and surface mounted light fixture boxes must have four inch square single raised device covers.

Flush-mounted boxes must have stainless steel covers, 0.04 inches thick. Surface-mounted boxes must have galvanized steel covers with metal screws. Cover screws must be metal with finish to match cover finish.

Sectional device plates will not be permitted.

Cast boxes and weatherproof boxes must be cast iron boxes with threaded hubs complying with NEMA FB-1, and must be of the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches square by 1-7/8 inches deep.

Cast boxes and weatherproof boxes must have cast iron covers with gaskets.

Weatherproof device boxes must have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Pull Boxes:

Pull boxes must comply with section 86-1.02C.

Traffic rated pull boxes must comply with section 86-1.02C.

Electrical pull box covers and traffic rated pull box covers must be marked "ELECTRICAL."

99-16050B(4) Receptacles and Switches

Not Used

99-16050B(5) Miscellaneous Materials

Warning Tape: Warning tape must be 4 inches wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 3/4-inch black letters at 30-inch intervals on bright orange or yellow background. The printed warning must be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape must have a tensile strength of not less than 155 pounds per 4-inch wide strip and must have a minimum elongation of 700 percent before breaking.

Pull Rope: Pull rope must be nylon or polypropylene with a minimum tensile strength of 1800 pounds.

Ground Rod: Ground rod must be a 3/4-inch (minimum) galvanized or copper clad steel rod, 10 feet long, and must conform to the requirements in NEMA GR-1.

99-16050C Construction

Conduit:

Conduits must be installed to comply with section 87-1.03B and the following:

1. All conduits must be rigid steel except as follows:
 - a. EMT may be used in walls and furred spaces and for exposed work indoors above the switch height.
 - b. Flexible metallic conduit must be used to connect suspended , and other equipment subject to vibration in dry locations.
 - c. PVC coated rigid steel conduit must be used where shown for fuel islands, salt storage and sand storage buildings, and base elbows and vertical risers through concrete slabs.
 - d. Rigid non-metallic conduit must be used in underground, exterior locations.
2. Rigid non-metallic conduit bends of 30 degrees or greater must be factory-made long radius sweeps. Bends less than 30 degrees must be made using an authorized heat box.
3. Locations of conduit runs must be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and must not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.
4. Where practical, conduits must be installed in groups of parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.
5. Exposed conduit must be installed parallel and at right angles to the building lines.
6. All raceway systems must be secured to the building structures using specified fasteners, clamps and hangers.
7. All metal conduits, fittings, and elbows in contact with soil or concrete must be wrapped with a double layer of 20-mil thick pipe wrapping tape.
8. Single conduit runs must be supported by one hole conduit clamps. Single conduit runs on walls in damp or wet locations must be installed with clamp backs to space conduit off the surface.
9. Multiple conduit runs must be supported with construction channel secured to the building structure. Conduits must be fastened to construction channel with channel compatible pipe clamps.
10. Raceways of different types must be joined using authorized couplings or transition fittings.
11. Expansion couplings must be installed where conduit crosses a building separation or expansion joint.

Conduit Terminations:

Rigid steel conduits must be securely fastened to cabinets, boxes and gutters using 2 locknuts and insulating metallic bushing. EMT must be securely fastened to cabinets, boxes and gutters using connectors. Conduit terminations at exposed weatherproof and cast boxes must be made watertight using hubs.

Grounding bushings with bonding jumpers must be installed on all conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduit must be terminated inside the underground pull boxes with an authorized conduit bushing or fitting. All conduits must enter vertically through the bottom of pull boxes.

All future conduits terminated in underground pull boxes or left exposed indoors and outdoors must be provided with watertight conduit plugs.

Warning Tape: Warning tape must be placed over each conduit in a trench. Each warning tape must be centered over the conduit and must be placed over the 6 inch layer of sand covering the conduit.

Conductor and Cable Installation:

Conductors must not be installed in conduits until all work of any nature that may cause injury is completed. Care must be taken in pulling conductors so that insulation is not damaged. An authorized non-petroleum base and insulating type pulling compound must be used as needed.

All cables must be installed and tested to comply with manufacturer's instructions.

Splices and joints must be insulated with insulation equivalent to that of the conductor.

Six inches of slack must be provided at each outlet and device connection. If the outlet or device is not at the end of a run of conductor, connection must be made with correctly colored pigtails tapped to the runs with splices.

All pressure type connectors and lugs must be retightened after the initial set.

Splices in underground pull boxes and similar locations must comply with section 87-1.03H.

Junction boxes in furred or accessible ceiling spaces must be identified on the cover plate with permanent marking pen denoting the circuits contained in the box.

Conductor Identification:

The neutral and equipment grounding conductors must be identified as follows:

1. Neutral conductor must have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white markers such as paint or white tape at each termination.
2. Equipment grounding conductor may be bare or insulated. Insulated equipment grounding conductors must be green or green with one or more yellow stripes over its entire length. Conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape at all accessible locations over the entire exposed conductor.

Ungrounded feeder and branch circuit conductors must be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding must be as follows:

SYSTEM	COLOR CODE
120/240 volt-Single phase	Black, blue

Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code must be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor must be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices must be identified at each termination with the conductor numbers shown and shop drawings, where deemed necessary.

Identification must be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

The identifying numbers of the terminating conductors, as shown on the shop drawings, must be identified on the terminal block marking strip.

Outlet, Device and Junction Box Installation:

Where exposed rigid steel conduits are connected to an exposed outlet, device, or junction box at or below switch height, the box must be a cast box.

All boxes must be finished flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers must be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings must be left in any box. Knockout seals must be installed to close openings.

Adjustments to locations of outlet, device and junction boxes may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions must not be mounted back to back. Through-wall boxes will not be allowed.

Boxes installed in metal stud walls must be equipped with brackets designed for attaching directly to the studs or must be mounted on heavy gauge galvanized steel, snap-in box supports.

Multiple switches must be installed in standard boxes.

Pull Box Installation:

Pull box installation must comply with section 87-1.03C(3) and the following:

1. Top of pull boxes must be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box must be set at plus one inch above surrounding grade. Pull boxes shown in the vicinity of curbs must be placed adjacent to the back of curb. Pull boxes shown adjacent to lighting standards must be placed on the side of foundation facing away from traffic.

Ground Rod Installation: The ground rod must be driven vertically until the top is 6 inches above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, authorized by the Engineer, must be installed.

Anchorage:

Hangers, brackets, conduit straps, supports, and electrical equipment must be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices must be installed to comply with the anchorage manufacturer's instructions.

99-16050D Payment

Not Used

99-16432 ELECTRICAL EQUIPMENT

99-16432A General

99-16432A(1) Summary

Scope: This work consists of furnishing and installing panelboards, disconnect switches, and related accessories.

Related Work: Anchorage devices must comply with section 99-16050.

99-16432A(2) Definitions

Not Used

99-16432A(3) Submittals

Product Data:

Submit a list of materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials and equipment. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. All control and power conductors on the shop drawings must be identified with wire numbers.

99-16432A(4) Quality Control and Assurance

Not Used

99-16432B Materials**99-16432B(1) Panelboards**

Panel Eastbound: Panel Eastbound_ must be outdoor NEMA 3R type, surface-mounted, factory assembled, 1-phase, 3-wire, 120/240-volt, AC panelboard at least 13" inches wide with 100-ampere main circuit breaker, with 20-Space 20-circuit, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company, Westinghouse, General Electric, or equal.

99-16432B(2) Starters

Not Used

99-16432B(3) Switches

Pump Disconnect Switch: Pump Disconnect switch must be 2-pole, 240-volt, AC, 20-ampere, non-fusible, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

99-16432B(4) Transformer

Not Used

99-16432B(5) Miscellaneous Materials

Nameplates: Nameplates must be laminated phenolic plastic with white core and black front and back. Nameplate inscription must be in capitals letters etched through the outer layer of the nameplate material.

Warning Plates: Warning plates must be laminated phenolic plastic with white core and red front and back. Warning plates inscription must be in capital letters etched through the outer layer of the nameplate material.

Device Labels: Device labels must be industrial type, preprinted labels with adhesive backed white core and black front and back. Device labels must resist fading, scratching, moisture, heat, chemicals, ultraviolet (UV) exposure and cleaning fluids. Device labels must be K-Sun Labels; Dymo Letra Tag or equal.

99-16432C Construction

Existing Panelboards: Provide new circuit breakers, where required to match existing type unless otherwise shown. Provide mounting hardware, bus straps, and related materials for proper circuit breaker installation. Provide new panelboard identification nameplate with designation as shown for each panelboard. Remove existing nameplates where applicable. Provide new typewritten circuit directory reflecting changes.

Panelboard Installation:

Set cabinets plumb and symmetrical with building lines. Train interior wiring to comply with "Conductor and Cable Installation" in section 99-16050. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.

Mounting height must be 5½ feet to the highest circuit breaker handle, measured above the finished floor.

Where Space" is shown, branch connectors, mounting brackets, and other hardware must be furnished and installed for future breaker.

A typewritten directory under transparent protective cover must be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker must include complete information concerning equipment controlled, including room number or area as shown.

Equipment Identification:

Equipment must be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions must read as follows:

Item	Letter height, inches	Inscription
Eastbound	1/4	120/240 V, 1 PH, 3W

Warning Plates:

Warning plates must be attached to designated equipment with self-tapping cadmium-plated screws or nickel-plated bolts.

99-16432D Payment

Not Used

99-16520 CLOSED CIRCUIT TELEVISION SYSTEM

99-16520A General

99-16520A(1) Summary

Scope: This work consists of furnishing and installing closed circuit television system. Closed circuit television (CCTV) system must be color type consisting of the following:

1. Cameras
- 2, Camera lens
2. Camera enclosure
3. Mounting bracket
4. Power supply
5. Monitors
6. DVR
7. Pan and tilt unit
8. Receiver
9. Keyboard
10. Camera cable
11. Other equipment required by the CCTV manufacturer to install a complete system without additional cost to the Department.

The number of components must be as shown.

99-16520A(2) Definitions

Not Used

99-16520A(3) Submittals

Submit manufacturer's descriptive data, factory testing documentation, catalog cuts, block diagram, installation instructions and mounting details. Block diagram must include all cables and components of the system.

99-16520A(4) Quality Assurance and Control

Not Used

99-16520B Materials

Camera:

The camera must be assembled and tested prior to delivery to the job site. Camera assemblies must be delivered to the job site as a complete unit.

The camera must be high resolution, Complementary Metal-Oxide Semiconductor (CMOS) color camera and must comply with following:

1. Have a resolution of 1920 x 1080, Imaging system must have CMOS image sensor.
2. Have an electronic shutter from 1 to 1/10,000 s
3. Have the following exposure control: Full Auto, Shutter Priority, Aperture Priority, Manual Color balance must be through-the-lens type, with less than 10 IRE units unbalance from 2850 to 5800 degrees K.
4. Camera must operate on 115 V, AC, 60 Hz.
5. Power consumption with heater off must be less than 10 watts. Power consumption with heater on must be less than 20 watts.
6. Have auto-focus
7. Have 20x optical zoom and 12x digital zoom
8. Have 360-degree endless pan
9. Have a maximum tilt/pan speed of 300 degrees/sec
10. Have day/night operation
11. Have 256 position presets
12. Have JPEG, MPEG-4, and H.264 image compression
13. Have a frame rate of 30 fps (H.264)
14. Support the following protocols: TCP/IP, HTTP, ARP, ICMP, FTP, SMTP, DHCP, SNMP, DNS, NTP protocols included.
15. Have a 10Base-T/100Base-TX Ethernet interface
16. Have an external microphone input
17. Have an audio line output
18. Have an operating temperature range from 23 to 122 degrees F
19. Have a storage temperature range from -4 to 140 degrees F
20. Have a built in web browser interface (Microsoft Internet Explorer)
21. Have 802.1X network protocol

The camera must be designed to operate under low light conditions and must function satisfactorily over a wide range of dynamic lighting conditions ranging from low light to full sun light.

The camera and video system must be capable of superimposing a written camera identification message over the video display. The identification must be programmable up to two lines of 24 characters per line. Text characters must be white with a black border 28 horizontal TV lines in height. The camera identification must be programmable from a computer or tablet interface provided with system.

Camera Enclosure:

The signal camera enclosure must comply with the following requirements:

1. Outdoor pendant dome style
2. Clear (un-tinted) camera window
3. Thermostatically controlled heater
4. Thermostatically controlled vent fan

The complete camera assembly must comply with the following environmental requirements:

Temperatures	-40 to 140 degrees F
Humidity	100 percent relative humidity
Vibration	Swept 5-60 Hz, 0.082 inch amplitude (15 G's at 60 Hz); Random 60-1000 Hz 5 G's RMS
Shock	Up to 30 G's any axis under no operating conditions; MIL -E-5400T, para 3.2.24.6
Sand & Dust	MIL-E-5400 T, para 3.2.24.7
Fungus Salt	MIL-E-5400 T, para 3.2.24.8
Atmosphere	MIL-E-5400 T, para 3.2.24.9
Explosion	MIL-E-5400 T, para 3.2.24.10
EMI	FCC Rules, part 15, subpart J for Class devices
Acoustic Noise	+150 dB

A sunshield must be supplied and installed on the camera for protection from direct sunlight. The sunshield must be constructed to allow free passage of air between the housing and the shield but must not place an excessive load on the pan and tilt unit in high winds.

Power Supply:

The power supply must be compatible with the camera and must have the following requirements.

1. Input voltage: 120/240 V(ac)
2. Output voltage: 24 V(ac)
3. Output current: 4 A max
4. Surge protection: 4 A fuse

Monitor:

Monitors must be liquid crystal display (LCD) monitor with 24 inches active thin film transistor (TFT) with multimode functionality and must comply with the following:

1. LCD panel pixel array must be not less than 1280 by 1024 pixel at 75 Hz.
2. Panel aspect ratio must be 4:3 composite.
3. Brightness must not be less than 35.3 cd/ft square.
4. Contrast ratio must not be less than 500:1.
5. Panel lamp life must not be less than 40,000 hours.
6. Viewing angle (horizontal/vertical) must be 150-130 degrees.
7. Tilt must be 10 to 45 degrees and display colors must not be less than 16.7 million.
8. Response time must not be less than 8 ms.
9. Speakers must be integrated, 2 x 1.0 watt.
10. Indicators must be LED (power on, standby, sleep) on screen.
11. Input voltage must be 120 VAC, 60 Hz, with internal power supply.
12. Power consumption must be less than 50 W (on) and less than 5 W (standby).
13. Video input interface must be compatible with the video system.
14. Vertical frequency must be 56 to 75 Hz.
15. Sync format must be NTS/PAL auto screening.
16. Operating humidity must be 20to 85 percent, non-condensing.
17. Operating temperature must be 32 to 104 degrees F.

DVR:

The DVR must be microprocessor-based video display and recording system that can be programmed through an on-screen menu. DVR must be capable of displaying one to four video inputs live simultaneously in one monitor. DVR must be capable of driving a second monitor,

displaying additional live camera feed. DVR must have functionality to record and review live camera feeds. DVR must have a mouse interface to control pan, tilt, zoom, and other basic functions of all attached cameras.

The DVR must comply with the following:

Video inputs	16
Maximum signal level	2.0 volt peak to peak
Video outputs	2
Gain	Unity
Supply voltage	120-volt, AC, 60 Hz
Character generation type	White with black outline
Camera identification	One line, twenty characters
Date/Time	One line

Pan and Tilt Unit:

The pan and tilt unit must integrate with a receiver/driver to form one package at each camera site where shown. The integrated receiver/driver must communicate with multiprocessor control units. Camera and pan and tilt functions must be operable via up-the-coax telemetry communications.

The pan and tilt drive must be a medium-duty, counterbalanced unit designed for operation with loads up to 35 pounds. The pan and tilt drive must include a drive motor with a factory lubricated, hardened-steel gear train that requires no field lubrication, and quad ring seal with Teflon wear surface for protection in severe conditions. Operational stability be provided by self-energizing brake integral with the drive motor, or by solenoid-operated brake.

The pan and tilt unit must comply with the following:

1. The travel angle of the pan and tilt drive unit must be 350 degrees minimum in the horizontal plane and ± 90 degrees in the vertical plane. Position of camera stops must be approved by the Engineer.
2. The pan and tilt unit must provide positional feedback through an internal potentiometer to accommodate preset positions, controlled from the multiprocessor control units and the transmitter/receiver control box.
3. The pan and tilt unit must pan at a nominal speed of 5 to 10 degrees per second, and tilt at a nominal speed of 2 to 4 degrees per second.
4. The pan and tilt unit must have instantaneous reverse motor action. Dynamic braking must also be incorporated to prevent drift.
5. Heavy duty roller bearings must be used on all rotating surfaces. Rotor gears must be made from hardened steel and low temperature lubricant must be used. Gasket seals must be incorporated to ensure all-weather protection. All internal parts must be corrosion protected.
6. Provisions must be made for mounting the weatherproof outdoor enclosure with the camera assembly to the pan and tilt unit at the correct pivot point.
7. The pan and tilt unit must be capable of supporting a maximum load of 40 pounds at 5 inches from the tilt table surface to the center of gravity.
8. The pan and tilt unit must be the adjustable worm gear final drive type to prevent drift and minimize backlash.
9. The pan and tilt unit must be powered and controlled from the transmitter/receiver control box.
10. Input voltage must be provided by the remote control receiver. Input must be 115 V, AC. Input power must be 21 VA pan and 21 VA tilt.
11. The pan and tilt unit must be approximately 11 inches tall and 9 inches wide.

All parts must be corrosion-protected steel or aluminum. Finish must be off-white baked enamel. Pan bearings must be heavy duty ball bearings. Tilt bearings must be oil tight bronze bushings. Gears must be hardened steel. Seals must be quad ring and gasket seals for all weather environmental protection. Ambient temperature range must be -10 to 120 degrees F. Overload protection must be motor thermal for tilt and motor clutch for pan.

Mounting adapters, cables, brackets, connectors, potting sleeves, potting materials, and auxiliary materials required to install the pan and tilt unit must be provided to suit the units furnished.

Receiver:

The receiver must consist of the equipment required to interface with the camera, camera lens, pan and tilt unit, enclosure, and controller/sequencer. Remote control command must be sent by the remote controller over cables as shown.

The receiver must have the following features:

Signal Input/output	1.00 V p-p composite video.
Lens outputs	12 V DC switched on command from the remote controller so as to allow the zoom and focus lens functions to operate over their entire range at the command of the operator.
Connectors	For pan/tilt unit and camera - 37 pin AMP type. For video - BNC type.
Supply voltage	115 V AC, 60 Hz ($\pm 10\%$).
Camera Voltage	115 V AC
Construction	NEMA Type 4 enclosure.

Keyboard:

The keyboard must be a full-feature keyboard that offers pan-tilt-zoom (PTZ) control, programming, camera and monitor call-up, operation of sequences and patterns, and added function keys that allow control of receiver auxiliaries. The function keys must have dual selections to allow for remote control of multiplexer functions.

The keyboard must have a three-axis, vector-solving joystick that includes a twisting, return to center head for precise, single-hand control of PTZ functions. The keyboard must be connected to the switcher by the cable and accessories provided by the manufacturer.

Cables, Connectors and Harnesses:

Units or assemblies which require 120-volt AC power for operation must be furnished with a 6 foot long, 3-conductor power cable permanently affixed to its chassis or enclosure at one end such that it is fully protected from contact with metal edges. The chassis or enclosure must have a strain relief device to prevent strain on each internal connection to the power cable.

Cables must be compatible with the DVR.

All external connections must be made by means of connectors. All wires to and from the connectors must be color coded or appropriately marked. Cables from the camera and pan and tilt unit must be assembled by the camera manufacturer.

Connecting harnesses of appropriate length and terminated with matching connectors must be provided for interconnection with the communications system equipment.

All pins and mating connectors must be plated to provide proper electrical connection and resist corrosion. Connectors utilizing solder type connections must have each soldered connection covered by a piece of heat shrink tubing securely shrunk to ensure that it protects the connection.

All connectors must be compatible with the communications equipment interface. Connector pins and mating connectors must be plated to ensure proper electrical connection and resist corrosion.

99-16520C Construction

99-16520C(1) General

CCTV System Installation:

CCTV system must be installed as shown. Cameras and monitors must be adjusted for both day and night operations. The CCTV system must be installed where shown and by methods recommended by the manufacturer.

Provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the units.

99-16520C(2) Field Quality Control

Testing: Testing must consist of an operational test, CCTV control location tests, and a final CCTV test.

Operational Test:

Perform the operational test for the CCTV system in the presence of the Engineer.

The operational test must demonstrate that all functions of the system operate in the manner described in the manufacturer's literature.

Notify the Engineer at least 10 days before performing the operational tests.

CCTV Control Location Tests:

CCTV control location tests must consist of:

1. Viewing video images as the lens focal lengths and apertures of the lens is varied from the multiprocessor camera control, master and remote change.
2. Verifying the correct operation of the auto iris, power zoom and imager protection features from the multiprocessor camera control, master and remote locations.
3. Verifying the correct operation of the pan and tilt unit from the multiprocessor camera control, master and remote locations.
4. Verifying the correct real time display operation of the DVR. The DVR must switch the chosen video input signals to the chosen monitors without blocking other signals.
5. Verifying the recording operation of the DVR. The DVR must play back recorded video from all cameras.

Final CCTV Test:

The final CCTV test measure the video signal received using a NTSC waveform monitor to confirm video levels and signal-to-noise ratio specification compliance for daytime and nighttime operation at each of the camera locations.

The pan and tilt unit must be functionally tested over 350 degrees in the horizontal plane and ± 90 degrees in the vertical plane. Confirm specification compliance for the lens operation, the auto and manual iris control, and the camera web interface.

99-16520C(3) Demonstration

Training: Provide 2 hours of on-site training on the use, operation, and maintenance of the CCTV system for not more than 6 designated Department employees. Notify the Engineer at least 10 days in advance of the proposed training class.

99-16520D Payment

Not Used

99-16911 PUMP CONTROL SYSTEM

99-16911A General

99-16911A(1) Summary

Scope: This work consists of furnishing and installing pump control enclosure and pump disconnect.

99-16911A(2) Definitions

Not Used

99-16911A(3) Submittals

Product Data:

Submit a list of materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. All control and power conductors on the shop drawings must be identified with wire numbers.

99-16911A(4) Quality Control and Assurance

Not Used

99-16911B Materials

99-16911B(1) General

Pump Control Enclosure, PCE:

Pump control enclosure must be single exterior hinged door, dust tight NEMA Type 3R enclosure, containing an electrical mounting panel and hinged interior deadfront door. The enclosure must be made of 14-gage steel minimum with all seams continuously welded. A rolled up lip must be provided around three sides of the hinged door and around all sides of the enclosure opening. The door must be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door must be maintained closed with door clamps. Security must be provided by a hasp and staple for padlocking.

The enclosure must be factory prewired to comply with NEMA Class IIC wiring. All wires entering the enclosure must terminate on terminal blocks. Wiring must be arranged so that any piece of apparatus may be removed without disconnecting any wires except the leads to that piece of apparatus.

A wiring diagram encased between two heat-fused laminated plastic sheets must be provided with brass mounting eyelets and attached to the inside of the enclosure.

Pump Main Breaker, MB: pump main breaker must be 1-pole, 120-volt, AC, molded case circuit breaker with 20-ampere frame, 20-ampere trip, and interrupting capacity of 10000 amperes (symmetrical) at 120 volts. Breaker must be Square D Company, Westinghouse, I.T.E., or equal.

Pump Disconnects, : Pump disconnects must be 1-pole, 120-volt, AC, 20-ampere frame, 20-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be 20 amperes (symmetrical) at 120 volts.

Time delay relays must:

1. Be 120-volt, electronic R1 is "ON-DELAY" AND R2 is (OFF-DELAY) types.
2. Have DPDT, double-break 10-ampere contacts, having a range of 0.6 to 600 seconds
3. Have time delays set for:
 - 3.1. R1-1: 5 seconds
 - 3.2. R2-1: 5 seconds

Neutral Bar, BAR: Neutral bar must be 100-ampere copper neutral bar with circuit taps.

Terminal Block, TB: Terminal block must be 50-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic must have a high resistance to heat, moisture, mechanical shock, and electric potential and must have a smooth even finish. Each block must have a molded marking strip attached with screws. Terminal blocks must have tubular, high pressure clamp connectors.

Indicating Lights, AL1 and AL2: Indicating lights must be panel mounting indicating lights with red lens with screw cap and Type S6, 6-watt, 120-volt lamp with candelabra screw base.

99-16911B(2) Fabrication

Component Mounting:

Ground Rod: Ground rod must be a 3/4-inch (minimum) galvanized or copper clad steel rod, 10 feet long, and must conform to the requirements in NEMA GR-1.

99-16911C Construction**99-16911C(1) Installation**

The pump control enclosure must be installed on a concrete pad and oriented as shown.

All bolts and fasteners must be galvanized.

All concrete around conduit penetrations must be finished smooth and sloped in a way to avoid standing water around the conduit.

99-16911C(2) Operation

Pump System: The pump unit must be automatically controlled by the pressure tank pressure switch, PS, and the float switches, FS1 and FS2, as shown on the plans.

99-16911D Payment

Not Used

**REVISED STANDARD SPECIFICATIONS
APPLICABLE TO THE 2018 EDITION
OF THE STANDARD SPECIFICATIONS**

Add to the table in the 1st paragraph of section 1-1.06:

04-19-19

CSC	conductor signal cable
-----	------------------------

04-17-20

NDS	National Design Specification for Wood Construction
BWC	Bonded wearing course

04-15-22

ALR	Area of Localized Roughness
IRI	International Roughness Index
MRI	Mean Roughness Index
PPF	Pavement Profile Format
ProVal	Profile Viewer and Analyzer
UAS	unmanned aircraft systems

Replace the row for *FDR* in the table in the 1st paragraph of section 1-1.06 with:

10-15-21

FDR	full depth recycling
-----	----------------------

Replace the definition of *schedule* in section 1-1.07B with:

04-15-22

schedule:

- baseline schedule:** Initial schedule showing the original work plan starting on the date of Contract approval. This schedule shows no completed work to date and no negative float or negative lag to any activity.
- update schedule:** Current schedule developed from the accepted baseline and any subsequent accepted update schedules through regular monthly review to incorporate actual past progress.

Replace the row for 12 in the table in the 1st paragraph of section 1-1.08 with:

04-17-20

12	Orange (Ora)	1750 E 4TH ST STE 100 SANTA ANA CA	1750 E 4TH ST STE 100 SANTA ANA CA 92705-3909
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Replace the 9th row in the table of section 1-1.11 with:

04-19-19

Department of Conservation, Division of Mine Reclamation	http://www.conservation.ca.gov/dmr	--	--
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last day for submitting the quote 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 5th day.

Submit a DBE Confirmation form for each DBE shown on the DBE Commitment form to establish that it will be participating in the Contract in the type and dollar amount of work shown on the form. If a DBE is participating as a joint venture partner, submit a copy of the joint venture agreement.

Failure to submit a completed DBE Confirmation form and a copy of the quote from each DBE will result in disallowance of the DBE's participation.

Add between the 4th and 5th paragraphs of section 2-1.15B:

10-19-18

Submit a copy of the quote from each DVBE listed on the Certified DVBE Summary form that describes the type and dollar amount of work shown on the form no later than 4 p.m. on the 4th business day after bid opening.

Add between the 3rd and 4th paragraphs of section 2-1.15C(1):

10-19-18

Submit a copy of the quote from each DVBE listed on the Certified DVBE Summary form that describes the type and dollar amount of work shown on the form no later than 4 p.m. on the 4th business day after bid opening.

Add between the 1st and 2nd paragraphs of section 2-1.18C:

10-19-18

Failure to submit a completed Certified Small Business Listing for the Non–Small Business Preference form by 4 p.m. on the 2nd business day after bid opening will result in a nonresponsive bid.

Replace section 2-1.33B with:

10-19-18

2-1.33B Bid Form Submittal Schedules

2-1.33B(1) General

The *Bid* book includes forms specific to the Contract. The deadlines for the submittal of the forms vary depending on the requirements of each Contract. Determine the requirements of the Contract and submit the forms based on the applicable schedule specified in section 2-1.33B.

Bid forms and information on the form that are due after the time of bid may be submitted at the time of bid.

2-1.33B(2) Federal-Aid Contracts

2-1.33B(2)(a) General

Section 2-1.33B(2) applies to a federal-aid contract.

2-1.33B(2)(b) Contracts with a DBE Goal

2-1.33B(2)(b)(i) General

Section 2-1.33B(2)(b) applies if a DBE goal is shown on the *Notice to Bidders*.

2-1.33B(2)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

**Bid Form Submittal Schedule for a
Federal-Aid Contract with a DBE Goal**

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Small Business Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid
DBE Commitment	No later than 4 p.m. on the 5th day after bid opening ^b
DBE Confirmation	No later than 4 p.m. on the 5th day after bid opening ^b
DBE Good Faith Efforts Documentation	No later than 4 p.m. on the 5th day after bid opening ^b

^aSubmit only if you choose the option.

^bIf the last day for submitting the bid form 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.

2-1.33B(2)(b)(iii) Reserved

2-1.33B(2)(c) Contracts without a DBE Goal

2-1.33B(2)(c)(i) General

Section 2-1.33B(2)(c) applies if a DBE goal is not shown on the *Notice to Bidders*.

2-1.33B(2)(c)(ii) Bid Form Schedule

Submit the bid forms according to the schedule shown in the following table:

**Bid Form Submittal Schedule for a
Federal-Aid Contract without a DBE Goal**

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration numbers	10 days after bid opening
Small Business Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid

^aSubmit only if you choose the option.

2-1.33B(2)(c)(iii) Reserved

2-1.33B(2)(d)–2-1.33B(2)(h) Reserved

2-1.33B(3) Non-Federal-Aid Contracts

2-1.33B(3)(a) General

Section 2-1.33B(3) applies to non-federal-aid contracts.

2-1.33B(3)(b) Contracts with a DVBE Goal

2-1.33B(3)(b)(i) General

Section 2-1.33B(3)(b) applies if a DVBE goal is shown on the *Notice to Bidders*.

2-1.33B(3)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

**Bid Form Submittal Schedule for a
Non-Federal-Aid Contract with a DVBE Goal**

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid
Certified DVBE Summary	No later than 4 p.m. on the 4th business day after bid opening
California Company Preference	Time of bid
Request for Small Business Preference or Non–Small Business Preference ^a	Time of bid
Certified Small Business Listing for the Non–Small Business Preference ^a	No later than 4 p.m. on the 2nd business day after bid opening

^aSubmit only if you choose the option or preference.

2-1.33B(3)(b)(iii) Reserved

2-1.33B(3)(c) Contracts without a DVBE Goal

2-1.33B(3)(c)(i) General

Section 2-1.33B(3)(c) applies if a DVBE goal is not shown on the *Notice to Bidders*.

2-1.33B(3)(c)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Replace section 4-1.07 with:

04-16-21

4-1.07 VALUE ENGINEERING

4-1.07A General

Reserved

4-1.07B 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
4. Right-of-way delay or third-party utility delay
5. Public impact

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, including:

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 plan 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 9-1.04.
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

Submit a VECP using the Value Engineering Change Proposal Submittal form to the Engineer and the electronic mailbox on the form. The Engineer will acknowledge receipt of a VECP within 5 business days.

The Department makes every effort 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 plans or specifications adopted by the Department before Contract award, the Department may make these changes without VECP payments. A VECP concept based on an alternative not chosen, but contemplated by the Department before bid, will be considered as a VECP.

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. In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation costs,

including parts paid by you. After written acceptance, the Department considers the VECP and deducts the agreed cost of the investigation.

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. Adjusts the payment so that the Change Order results in a credit to the Department of 50 percent of the estimated net construction-cost savings, except if the VECP provides a reduction in traffic congestion or avoids traffic congestion

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department adjusts the payment that results in a credit to the Department of 40 percent of the estimated net construction-cost savings 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.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from the Contract time.

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 for 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.

4-1.07C Preconstruction Value Engineering Meeting

You may request a preconstruction value engineering meeting by submitting a request after Contract approval and before the start of Contract time.

The preconstruction value engineering meeting creates opportunity for the Contractor and Department personnel involved in daily construction of the project to examine the Contract prior to the start of Contract time to identify potential cost or time saving proposals.

The Department offers the preconstruction value engineering meeting to:

1. Allow real-time feedback on ideas from either the Contractor or Department construction personnel
2. Expedite the process of developing and approving a VECP

The Department may postpone the start of Contract time based on the time required to develop and obtain approval of the VECP if:

1. Meeting results in a viable conceptual VECP
2. Project critical path method schedule is affected

Postponement of the start of Contract time does not apply to a cost-plus-time Contract.

4-1.07D Value Analysis Workshop

Section 4-1.07D applies to a non-building-construction 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 4-1.07B

Replace the 6th paragraph of section 5-1.13B(2) with:

10-19-18

If the Department authorizes the termination or substitution of a listed DBE, make good faith efforts to find another DBE. The substitute DBE must (1) perform at least the same dollar amount of work as the original DBE under the Contract to the extent needed to meet the DBE goal and (2) be certified as a DBE with the most specific available NAICS or work code applicable to the type of work the DBE will perform on the Contract at the time of your request for substitution. Submit your documentation of good faith efforts within 7 days of your request for authorization of the substitution. The Department may authorize a 7-day extension of this submittal period at your request. Refer to 49 CFR 26 app A for guidance regarding evaluation of good faith efforts to meet the DBE goal.

Replace the 2nd sentence in the 2nd paragraph of section 5-1.13C with:

10-19-18

The substitute must be another DVBE, unless DVBEs are not available. The substitute must perform the work originally stated.

Replace the 6th paragraph of section 5-1.13C with:

10-19-18

If a DVBE substitute is not available, requests for substitutions of a listed DVBE must include:

1. Contact with the DVBE advocate from the Department and the Department of Veteran Affairs
2. Search results from the Department of General Services' website of available DVBEs
3. Communication with a DVBE community organization nearest the job site, if applicable
4. Documented communication with DVBEs describing the work to be performed, the percentage of the total bid, the corresponding dollar amount, and the responses to the communication

Add to the list in the 1st paragraph of section 5-1.16:

10-16-20

5. Coordinate and manage project safety work

Replace section 5-1.24 with:

10-19-18

5-1.24 CONSTRUCTION SURVEYS

5-1.24A General

The Department places stakes and marks under chapter 12, "Construction Surveys," of the Department's *Surveys Manual*.

Submit your request for Department-furnished stakes:

1. Once staking area is ready for stakes
2. On a Request for Construction Staking form

After your submittal, the Department starts staking within 2 business days.

Preserve stakes and marks placed by the Department. If the stakes or marks are destroyed, the Department replaces them at the Department's earliest convenience and deducts the cost.

Replace section 5-1.26 with:

10-19-18

5-1.26 RESERVED

Replace section 5-1.28 with:

04-16-21

5-1.28 PROJECT SAFETY REVIEWS

Your assigned project safety representative must perform and document project safety reviews with the Engineer:

1. At least 3 business days before the start of job site activities
2. Every other week after the start of job site activities and after any incident that results in serious injury, illness, or fatality to your personnel, subcontractor's and supplier's personnel, and any other persons present at the job site at the request of you or your subcontractors
3. Submit project safety review documentation to the Engineer and correct deficiencies within 3 business days from the day the project safety review is completed or sooner as directed by the Engineer

Upon Contract acceptance, your project safety representative must participate in a safety meeting with the Engineer.

Replace section 5-1.29 with:

04-16-21

5-1.29 JOB HAZARD ANALYSES

Prepare a job hazard analysis for each work activity to be performed on the job site as required by CA Code of Regs § 3203(a)(4) and 1511(b).

Submit each job hazard analysis as an informational submittal.

Each job hazard analysis must identify the following:

1. Work activity description
2. Existing and predictable hazards associated with the work activity
3. Hazard control measures, preventative, or corrective actions to be taken for the work activity

Submit each job hazard analysis at least 5 working days before the start of a work activity. During the project safety reviews required under Section 5-1.28, discuss job hazard analyses for active work activities and work activities planned to start within 5 working days.

Submit a revised job hazard analysis when equipment or methods change results in a change to the hazards previously identified. Submit a revised job hazard analysis within one working day of the identified change.

Replace the 2nd paragraph of section 5-1.37B(3) with:

10-15-21

You may cross the bridge with pneumatic-tired material hauling equipment that exceeds the size and weight limits specified but that does not exceed the load limits shown on the "Material Hauling Equipment Loading" chart.

Replace items 3 and 4 in the 3rd paragraph of section 5-1.37B(3) with:

10-15-21

3. Confine equipment to the material hauling equipment lane using temporary barriers unless the plans show that the entire bridge may be used for hauling equipment and the permanent barriers are completed.

4. Allow at most 1 piece of equipment on the bridge at one time.

Add to the list in the 3rd paragraph of section 5-1.37B(3):

04-15-22

5. Operate equipment at a maximum speed of 25 mph.

Replace the 2nd and 3rd paragraphs of section 5-1.43A with:

10-18-19

Submit potential claim records using the Department's Internet potential claim system. For information on submittal of potential claim records using the Internet potential claim system, go to the Department's Division of Construction website.

A potential claim record that you submit using the Internet potential claim system is the same as the originator of the claim and you signing the potential claim record.

For the Internet potential claim system, potential claim records are:

1. Initial Potential Claim Record form
2. Supplemental Potential Claim Record form
3. Full and Final Potential Claim Record form
4. Closed Potential Claim Record form

Submit a Closed Potential Claim Record form if you choose not to pursue an Initial Potential Claim Record that has been submitted.

Replace item 3.3.4 in the list in the 2nd paragraph of section 5-1.43D with:

04-17-20

- 3.3.4. Equipment rates at the rental rates listed in Labor Surcharge and Equipment Rental Rates in effect when the affected work related to the potential claim was performed

Add between the 2nd and 3rd paragraphs of section 5-1.43D:

04-17-20

If the total potential claim cost exceeds \$500,000, include an independent CPA cost audit report. Submit the audit report within 70 days of the completion of the potentially claimed work. The CPA's cost audit must be performed as an examination-level engagement under the attestation engagements in the *Government Auditing Standards* published by the Comptroller General of the United States. The attest documentation prepared by the CPA in connection with the audit must be submitted for review with the audit report. Within 20 days of the Engineer's request, make your financial records available for an audit by the State for verifying the actual cost described in your audit. The Department does not participate in costs for the report where no entitlement is determined. If entitlement is determined, the Department pays for 1/2 the cost of the report; the Contractor pays for the other 1/2. The cost is determined under section 9-1.05 except no markup is allowed.

Replace section 5-1.43E with:

10-15-21

5-1.43E Alternative Dispute Resolution

5-1.43E(1) General

5-1.43E(1)(a) General

The ADR process must be used for the timely resolution of disputes that arise out of the work.

You must comply with section 5-1.43E to pursue a claim, file for arbitration, or file for litigation.

The ADR process is not a substitute for submitting an RFI or a potential claim record.

Do not use the ADR process for disputes between you and subcontractors or suppliers that have no grounds for a legal action against the Department. If you fail to comply with section 5-1.43 for a potential claim on behalf of a subcontractor or supplier, you release the Department of the subcontractor's or supplier's potential claim.

Do not use the ADR process for quantification of disputes for overhead expenses or costs. For a dispute for overhead expenses or costs, comply with section 9-1.17D.

Each party and the DRA or DRB must complete the Dispute Resolution Advisor Agreement form or Dispute Resolution Board Agreement form and comply with the provisions of the agreement. For these forms, go to the Department's Division of Construction website.

No DRA- or DRB-related meetings are allowed until each party and the DRA or DRB, execute the agreement. However, each party and the DRA or DRB, may agree to sign and execute the agreement at the initial project meeting.

DRA or DRB members must attend each meeting with the parties.

DRA or DRB members must submit an updated disclosure statement whenever there is change in status.

The Department furnishes the DRA or DRB with the Contract documents and provides meeting facilities at no cost to you.

Neither party may meet nor discuss Contract progress or issues with the DRA or DRB members outside of progress meetings, traditional dispute meetings, and informal dispute meetings unless the other party is present or included in the communication.

5-1.43E(1)(b) Definitions

dispute meeting: Traditional and informal dispute meeting.

DRA: 1-member board established by the parties to assist in resolving disputes.

DRB: 3-member board established by the parties to assist in resolving disputes.

party: You or the Department.

1. **the parties:** You and the Department jointly.
2. **each party:** You and the Department severally.

outside technical services: Consultants with no prior direct involvement in the Contract.

5-1.43E(1)(c) Establishment of Procedures

Upon selecting the DRA or DRB, the parties must have an initial project meeting at the start of job site activities with the DRA or DRB to establish and agree to procedures for:

1. Submitting documents
2. Conducting hearings
3. Providing recommendations
4. Performing associated tasks

The established procedures must comply with the Contract and the Dispute Resolution Advisor Agreement or Dispute Resolution Board Agreement. The procedures need not comply with laws of evidence.

5-1.43E(1)(d) Progress Meetings

The parties must periodically meet with the DRA or DRB at the job site so the DRA or DRB members can keep abreast of construction activities and become familiar with the work in progress.

The meetings must be held at the start of job site activities and at least once every 3 months after that.

The parties may agree to waive the scheduled meetings when the only work remaining is plant establishment work or permanent erosion control establishment work.

5-1.43E(1)(e) Traditional Dispute Meetings

You must follow the traditional dispute meeting process to pursue a potential claim.

Either party may refer a dispute to the DRA or DRB. To request a dispute meeting, a party must submit a copy of the referral and supporting documentation to the DRA or DRB and the other party. The documentation must describe the dispute in individual discrete segments such that resolved and unresolved segments are differentiated. The party must include an estimate of the cost of the affected work and impacts to the work completion date.

If the dispute involves a subcontractor, the subcontractor's superintendent or project manager must attend the meeting otherwise your position paper is considered as your entire position.

Only the following persons are allowed to participate and present information at the meeting:

1. Engineer
2. Department's area construction engineer
3. Department's structure representative
4. Your superintendent
5. Your project manager
6. Either party's employees that have direct knowledge of the dispute and direct involvement in the project
7. Consultants directly involved in the development of the estimate or construction
8. Subcontractor's superintendent or project manager if the dispute involves a subcontractor

The person presenting information at the meeting must have been directly involved in the project at the time the dispute occurred.

The following persons are not allowed to attend the meeting:

1. Attorneys
2. Claim consultants
3. Outside technical services not employed by either party unless requested by the DRA or DRB

If the DRA or DRB needs outside technical services to help the DRA or DRB make a recommendation, the parties must agree to the services before they are provided. If the parties and the DRA or DRB agree, the technical services may be provided by technical staff who works for either party.

During a dispute meeting, each party presents its position, makes rebuttals, furnishes relevant documents, and responds to DRA or DRB questions and requests. The following is not allowed:

1. Testimony under oath
2. Cross-examination
3. Reporting of the procedures by a shorthand reporter or by electronic means

If either party fails to attend a dispute meeting, all documents submitted by the nonattending party is considered as the nonattending party's entire position, and the DRA or DRB and the attending party may proceed with the dispute process.

5-1.43E(1)(f) Informal Dispute Meetings

The parties may resolve small and uncomplicated disputes using an informal process. The parties may use this process only if the parties and the DRA or DRB agree its use is appropriate for resolving the dispute.

The informal dispute meeting process is independent from the traditional process. The Department does not grant time extensions for the traditional dispute process if the informal dispute process is used.

Each party furnishes the DRA or DRB a 1-page brief description of the dispute with supporting documentation and any additional information requested by the DRA or DRB.

In an informal dispute meeting, each party presents its position and receives the DRA's or DRB's recommendation orally on the same day the dispute is heard. The DRA or DRB furnishes a 1-page report confirming the recommendation within 5 business days.

Either party may ask for clarification of the DRA's or DRB's recommendation at the dispute meeting.

If the dispute remains unresolved, the parties must notify the DRA or DRB within 5 business days after receipt of the DRA's or DRB's written confirmation of the recommendation.

The DRA or DRB will not be bound by its informal recommendation if a dispute is later heard in a traditional dispute meeting.

If the dispute is not resolved using the informal dispute meeting process, the parties must comply with the traditional dispute meeting specifications.

5-1.43E(1)(g) Recommendations

Recommendations must be based on the Contract and contract documents.

Recommendations resulting from the ADR process are nonbinding.

If the parties resolve the dispute with the aid of the DRA's or DRB's recommendation, the parties must implement the resolution.

5-1.43E(1)(h) Completion of Alternative Dispute Resolution

All ADR activities must be completed before Contract acceptance. Accelerated timeframes may be used if the parties and the DRA or DRB agree.

If a dispute becomes an unresolved claim after Contract acceptance, comply with section 9-1.17D(2).

Neither party may call the DRA or DRB members who served on the Contract as a witness in arbitration or other proceedings that may arise from the Contract.

The parties must indemnify and hold harmless the DRA or DRB members from and against all claims, damages, losses, and expenses, including attorney's fees, arising out of and resulting from the findings and recommendations of the DRA or DRB.

5-1.43E(1)(i) Payment

Pay the DRA or each DRB member \$2,000 per day for the DRA's or DRB member's participation at each on-site meeting.

On-site meetings include:

1. Initial project meeting
2. Progress meetings
3. Dispute meetings

The payment includes full compensation for on-site time, travel time and expenses, transportation, lodging, and incidentals for each day or portion thereof.

Before a DRA or DRB member spends any time reviewing the plans or specifications, evaluating positions, preparing recommendations, completing forms, or performing any other off-site DRA- or DRB-related tasks, the parties must agree to pay for the tasks. Pay the DRA or DRB member \$200 per hour for these off-site tasks. This payment includes full compensation for incidentals such as expenses for telephone, fax, and computer services.

The Department does not pay for (1) any DRA- or DRB-related work performed after Contract acceptance or (2) your cost of preparing for or attending ADR meetings.

The Department pays:

1. \$2,000 for each DRA on-site meeting
2. \$6,000 for each DRB on-site meeting
3. \$200 per hour for agreed off-site DRA- or DRB-related tasks

The Department does not adjust the unit price for an increase or decrease in the quantity of:

1. DRA on-site meeting
2. DRB on-site meeting
3. Hourly off-site DRA- or DRB-related tasks

Within 60 days of receipt of Department's payment, submit copies of associated invoices and supporting documents in the form of a canceled check or bank statement for DRA- or DRB-payment verification.

5-1.43E(2) Dispute Resolution Advisor

5-1.43E(2)(a) General

Section 5-1.43E(2) applies if a bid item for dispute resolution advisor on-site meeting is shown on the Bid Item List.

Dispute Resolution Advisors must be on the Department's Dispute Resolution Advisor Candidates List at the Department's Division of Construction website.

To be listed on the Department's Dispute Resolution Candidates List, candidates must:

1. Submit a completed Candidate Application for Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) form
2. Meet the minimum qualifications for experience
3. Have completed training by the Department
4. Have served on at least 3 dispute resolution boards on a Department contract as a member or at least 2 dispute resolution boards on a Department contract as the chairman

Candidates must submit an updated resume on Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) Resume form annually or whenever there is a change in status of active DRAs or DRBs.

5-1.43E(2)(b) DRA Selection

Within 30 days after Contract approval, the parties must select a DRA using the following procedure:

1. Each party nominates 3 DRA member candidates, each candidate must:
 - 1.1. Be knowledgeable in the contract documents and the type of construction anticipated in the Contract
 - 1.2. Have no prior direct involvement on the Contract
 - 1.3. Have no financial interest in the Contract or with the parties, subcontractors, suppliers, consultants, or associated legal or business services within 6 months before award and during the Contract except for payments for Department DRA or DRB services or payments for retirement or pensions from either party not tied to, dependent on, or affected by the net worth of the party
2. The parties must request a disclosure statement from each nominated DRA candidate and must furnish them to the other party. Each statement must include:
 - 2.1. Current resume of the candidate's experience
 - 2.2. Declaration statement that describes past, present, anticipated, and planned professional or personal relationships with each of the following:
 - 2.2.1. Each party involved in the Contract
 - 2.2.2. Each party's principals
 - 2.2.3. Each party's counsel
 - 2.2.4. Associated subcontractors and suppliers
3. The parties are allowed:
 - 3.1. One-time objection to any of the three candidates without stating a reason
 - 3.2. Objection to any of the other party's subsequent candidates based on a specific breach of the candidate's responsibilities or qualifications under items 1 and 2 above
4. The parties must select 1 of the candidates to be the DRA. If the parties cannot agree on 1 candidate, each party must select 1 of the candidates nominated by the other and the DRA is decided between the 2 candidates by a coin toss.

5-1.43E(2)(c) DRA Replacement

The services of the DRA may end at any time with a notice of at least 15 days if either of the following occurs:

1. DRA resigns.
2. Either party replaces the DRA for failing to comply with the required employment or financial disclosure conditions of the DRA as described in the Contract and the Dispute Resolution Advisor Agreement.

A DRA replacement is selected the same way as the original DRA. The selection of a replacement DRA must start upon determination of the need for a replacement and must be completed within 15 days. The Dispute Resolution Advisor Agreement must be amended to reflect the change of the DRA.

5-1.43E(2)(d) DRA Traditional Dispute Meeting

If you choose to pursue a potential claim, refer the dispute to the DRA within 5 business days after receiving the Engineer's response to your Supplemental Potential Claim Record. The dispute meeting must be held no later than 25 days after the DRA receives the referral unless the parties agree otherwise.

At least 10 days before the scheduled dispute meeting, each party must furnish documentation to the DRA that supports its position and any additional information requested by the DRA. Upon receipt of both parties' position documentation, the DRA will provide each party the other party's position documentation.

If the DRA requests additional information within 5 business days after the dispute meeting, the party receiving the request must provide this information to the DRA and the other party within 5 business days after receiving the request.

The DRA furnishes a written recommendation within 10 days after the dispute meeting unless the parties agree to allow more time.

Within 5 business days after receiving the DRA's recommendation, either party may request clarification of any part of the recommendation. The DRA furnishes a written response within 2 business days of the request. Only 1 request for clarification from each party is allowed per dispute.

Within 10 days after receiving the DRA's recommendation, each party must furnish a written response to the DRA and the other party indicating acceptance or rejection of the recommendation. If a party rejects the recommendation and has new information that supports its position, the party may request reconsideration. The reconsideration request must be made within 10 days after receiving the DRA's recommendation. Only 1 reconsideration request from each party is allowed per dispute.

If the parties accept the DRA's recommendation but cannot agree on the time or payment adjustment within 30 days after accepting the recommendation, either party may request that the DRA recommend an adjustment.

5-1.43E(3) Dispute Resolution Board

5-1.43E(3)(a) General

Section 5-1.43E(3) applies if a bid item for dispute resolution board on-site meeting is shown on the Bid Item List.

Dispute Resolution Board Members must be on the Department's Dispute Resolution Board Candidates List at the Department's Division of Construction website.

To be listed on the Department's Dispute Resolution Board Candidates List, candidates must:

1. Submit a completed Candidate Application for Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) form
2. Meet the minimum qualifications for experience
3. Have completed training by the Department

Candidates must submit an updated resume on Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) Resume form annually or whenever there is a change in status of active DRAs or DRBs.

5-1.43E(3)(b) DRB Member Selection

Within 45 days after Contract approval, the parties must select DRB members and establish the DRB using the following procedure:

1. Each party nominates a DRB member candidate, each candidate must:
 - 1.1. Be knowledgeable in the contract documents and the type of construction anticipated in the Contract
 - 1.2. Have no prior direct involvement on the Contract
 - 1.3. Have no financial interest in the Contract or with the parties, subcontractors, suppliers, consultants, or associated legal or business services within 6 months before award and during the Contract except for payments for Department DRA or DRB services or payments for retirement or pensions from either party not tied to, dependent on, or affected by the net worth of the party
2. The parties must request a disclosure statement from each nominated DRB member candidate and must each furnish it to the other party. Each statement must include:
 - 2.1. Current resume of the candidate's experience
 - 2.2. Declaration statement that describes past, present, anticipated, and planned professional or personal relationships with each of the following:
 - 2.2.1. Each party involved in the Contract
 - 2.2.2. Each party's principals
 - 2.2.3. Each party's counsel
 - 2.2.4. Associated subcontractors and suppliers
3. The parties are allowed:
 - 3.1. One-time objection to the other party's candidate without stating a reason
 - 3.2. Objection to the other party's candidate based on a specific breach of the candidate's responsibilities or qualifications under items 1 and 2 above
4. If either party objects to the other party's candidate, the party whose candidate was objected to must nominate another DRB candidate within 5 business days.
5. The 1st candidate from a party that receives no objection becomes that party's selected DRB member.
6. Each party furnishes written notification to its selected DRB member.
7. Within 15 days after their notifications, the selected DRB members recommend to the parties the 3rd DRB member candidate and furnish that candidate's disclosure statement. If the 2 DRB members cannot agree on the 3rd DRB candidate, they will submit a list of two candidates to the parties for the final selection and approval.
8. Within 10 days after the recommendation, each party must notify the first 2 DRB members whether the party approves of or objects to the recommended 3rd DRB member candidate. Objections may be allowed based on item 3 above.
9. The 3 selected DRB members then decide who will act as the DRB chairman. If the parties do not agree with the selected chairman, the 3rd member will act as the DRB chairman.

5-1.43E(3)(c) DRB Member Replacement

The services of a DRB member may end at any time with a notice of at least 15 days if any of the following occurs:

1. A member resigns.
2. The Department replaces its selected member.
3. You replace your selected member.
4. The Department's and your selected members replace the 3rd member.
5. Either party replaces any member for failing to comply with the required employment or financial disclosure conditions of the DRB membership as described in the Contract and in the Dispute Resolution Board Agreement.

Replacing any DRB member must be accomplished by written notification to the DRB and the other party with substantiation for replacing the member.

A replacement DRB member is selected the same way as the original DRB member. The selection of a replacement DRB member must start upon determination of the need for a replacement and must be

Do not operate UAS over the traveled way unless preauthorized in writing by the Engineer. Launch and land UAS at least 50 feet from the edge of live traffic.

Replace item 1.3 in the list in the 2nd paragraph of section 7-1.02K(3) with:

- 1.3. Last four digits of social security number pursuant to Labor Code § 226(a)

10-18-19

Delete the 4th paragraph of section 7-1.02K(3).

10-16-20

Replace the 6th through 10th paragraphs of section 7-1.02K(3) with:

Submit certified payroll records electronically using the Department's contracted certified payroll internet system LCPtracker Pro. For information on submittal of certified payroll records using LCPtracker Pro, go to the LCPtracker website:

10-16-20

<https://www.lcptracker.com/solutions/lcptracker>

Request user account for your designated representative by submitting LCPtracker Vendor Access Request form.

Replace the 12th paragraph of section 7-1.02K(3) with:

Make all payroll records, including employee's complete social security number, available for inspection and copying or furnish a copy upon request of a representative of the:

10-18-19

1. Department
2. Division of Labor Standards Enforcement of the Department of Industrial Relations
3. Division of Apprenticeship Standards of the Department of Industrial Relations

Replace the 1st sentence in the 5th paragraph of section 7-1.02K(6)(a) with:

Submit copies of your Injury and Illness Prevention Program, Code of Safe Practices, and permits required by Cal/OSHA as informational submittals.

10-19-18

Replace section 7-1.02K(6)(j)(iii) with:

7-1.02K(6)(j)(iii) Unregulated Earth Material Containing Lead
Reserved

10-18-19

Replace *Reserved* in section 7-1.02M(2) with:

Submit the names and emergency telephone numbers of the nearest fire suppression agencies before the start of job site activities as an informational submittal. Post the names and phone numbers at a prominent place at the job site.

10-18-19

Submit a copy of your fire prevention plan required by Cal/OSHA as an informational submittal before the start of job site activities.

Cooperate with fire prevention authorities in performance of the work.

Immediately report fires occurring within and near the project limits by dialing 911 and to the nearest fire suppression agency by using the emergency phone numbers retained at the job site.

Prevent project personnel from setting open fires that are not part of the work.

Prevent the escape of and extinguish fires caused directly or indirectly by job site activities.

Replace the 2nd paragraph of section 7-1.02M(3) with:

04-19-19

For the list of permitted sites, go to the Department of Conservation, Division of Mine Reclamation website.

Replace the 13th paragraph of section 7-1.03 with:

10-18-19

For a taper on a bridge deck or approach slab, construct the taper with rapid setting concrete under section 60-3.02B(2) or polyester concrete under section 60-3.04B(2). Prepare the surface to receive the taper under section 60-3.02C(7). For tapers with aggregate fillers, rake conform edges to ensure smooth transitions. Cure the taper for at least 3 hours or the minimum time recommended by the manufacturer before opening to traffic.

Replace the 4th sentence in the 16th paragraph of section 7-1.03 with:

10-16-20

When not described and if ordered, providing flaggers is change order work.

Replace the 3rd sentence in the 7th paragraph of section 7-1.04 with:

10-16-20

When not described and if ordered, providing flaggers is change order work.

Replace the 13th paragraph of section 7-1.04 with:

10-18-19

Equipment must enter and leave the highway via existing ramps and crossovers and must move in the direction of traffic. All movements of workers and construction equipment on or across lanes open to traffic must be performed in a manner that do not endanger the public. Your vehicles or other mobile equipment leaving an open traffic lane to enter the construction area must slow down gradually in advance of the location of the turnoff to give the traffic following an opportunity to slow down. When leaving a work area and entering a roadway carrying traffic, your vehicles and equipment must yield to traffic. Compensation for flaggers, used for all movement of workers and construction vehicles and equipment on or across lanes open to traffic, is included in the bid items of work involved.

Replace section 7-1.06 with:

04-16-21

7-1.06 INSURANCE

7-1.06A 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.

7-1.06B Casualty Insurance

Obtain and maintain insurance on all of your operations with companies acceptable to the State as follows:

1. Keep all insurance in full force and effect from the start of the work through Contract acceptance.
2. 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 Civ Pro Code § 337.1.
3. All insurance must 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.

7-1.06C Workers' Compensation and Employer's Liability Insurance

Under Labor Code § 1860, secure the payment of worker's compensation under Labor Code § 3700.

Submit to the Department the following certification before performing the work (Labor Code § 1861):

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 signing constitutes your submittal of this certification.

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

Coverage shall contain a waiver of subrogation in favor of the State, including its officers, directors, agents, and employees.

If there is an exposure of injury to your employees under the US Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage must be included for such injuries or claims.

7-1.06D Liability Insurance

7-1.06D(1) General

Evidence General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of you providing insurance for bodily injury liability, property damage liability, and personal and advertising injury for the limits outlined in 7-1.06D(2). Coverage must extend to premises, operations and mobile equipment, personal and advertising injury, products and completed operations, and contractual liability. Coverage shall not contain a cross-suits exclusion barring coverage for a suit brought by or between Caltrans and another Insured in the policy. Coverage shall also not contain an exclusion for explosion, collapse and underground hazards. Such policies must contain an annual reinstatement of limits during construction operations.

7-1.06D(2) Liability Limits/Additional Insureds

The limits of liability must be at least the values shown in the following table:

Liability Limits

Total bid	For each occurrence ^a	Aggregate for products/completed operation	General aggregate ^b	Umbrella or excess liability ^c
≤ \$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

^aCombined single limit for bodily injury and property damage.

^bThis limit must apply separately to your work under this Contract.

^cThe umbrella or excess policy must contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted. The required umbrella liability limits are separate from and in addition to the required general liability limits. The umbrella or excess policies shall not contain exclusions barring follow-form coverage for required coverages in this specification.

Do not require a small business subcontractor to carry liability insurance that exceeds the limits shown in the preceding table. For a small business subcontractor, interpret *Total Bid* in the table as the dollar amount of subcontracted work.

As used in section 7-1.06D(2), a small business:

1. For a non-federal-aid contract is defined in 2 CA Code of Regs § 1896 and is incorporated by this reference
2. For a federal-aid contract is defined in 13 CFR 121.201 and is incorporated by this reference

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, must 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 you 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 you started work, unless such condition has been changed by the work or the scope of the work requires you to maintain existing roadway facilities and the claim arises from your 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 you that occurred during the course of the work; or
3. To the extent prohibited by Ins Code § 11580.04.

Additional insured coverage must be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured endorsement form CG 2010 and CG 2037 (for completed operations), as published by the Insurance Services Office (ISO), or equivalent form as approved by the Department.

7-1.06D(3) Contractor's Insurance Policies are Primary

The policy must 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 must not be called upon to contribute with this insurance.

7-1.06D(4) Contractor's Insurance - Waiver of Subrogation

The policy must stipulate that coverage contains a waiver of subrogation in favor of the State, including its officers, directors, agents (excluding agents who are design professionals), and employees.

7-1.06D(5) Contractor's Insurance - Separation of Insureds

The policy must stipulate that coverage shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

7-1.06E Automobile Liability Insurance

7-1.06E(1) General

Evidence automobile liability insurance, including coverage for all owned, hired, and non-owned automobiles. The primary limits of liability must be not less than \$1,000,000 combined single limit for each accident for bodily injury and property damage liability.

7-1.06E(2) Automobile Liability Insurance Scheduled on Excess Liability Policies

The umbrella or excess liability coverage required under section 7-1.06D(2) also applies to automobile liability. The required limits of liability can be achieved by any combination of primary and excess policies. Automobile liability coverage must be scheduled on excess liability policies in order to meet the required automobile liability limits.

7-1.06F Policy Forms, Endorsements, and Certificates

Provide your 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.

7-1.06G 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, you are responsible for any deductible amount and must warrant that the coverage provided to the State complies with section 7-1.06.

7-1.06H Enforcement

The Department may assure your compliance with your insurance obligations. Ten days before an insurance policy lapses, expires, or is canceled during the Contract period you must submit to the Department evidence of renewal through a binder or specimen copies of such policies or complete replacement of the policy.

If you fail to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to you or terminate your control of the work.

Any failure to comply with the reporting provisions of your policy shall not affect coverage provided to the State, including its officers, directors, agents (excluding agents who are design professionals), and employees.

You are not relieved of your 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.

The minimum insurance coverage amounts do not relieve you 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.

7-1.06I Self-Insurance

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If you use a self-insurance program or self-insured retention, you must 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 your acknowledgment that you will be bound by all laws as if you were an insurer as defined under Ins Code § 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Ins Code § 22.

For each schedule submittal, submit:

1. Plotted original, time-scaled network diagram on a sheet at least 8-1/2 by 11 inches with a title block and timeline in PDF file format
2. Schedule data in an authorized electronic file format. File name must include:
 - 2.1. Contract number
 - 2.2. Schedule number and date produced
3. Narrative report that includes:
 - 3.1. Transmittal letter
 - 3.2. Work completed during the period
 - 3.3. Identification of unusual conditions or restrictions regarding labor, equipment, or material
 - 3.4. Description of the current critical path
 - 3.5. Current and anticipated delays, including:
 - 3.5.1. Cause of delay
 - 3.5.2. Impact of delay on other activities, milestones, and completion dates
 - 3.5.3. Corrective action, mitigation, and schedule adjustments to correct the delay
 - 3.6. Reasons for any changes you propose to the planned work
 - 3.7. Pending items and status of:
 - 3.7.1. Permits
 - 3.7.2. Change orders
 - 3.7.3. Time adjustments
 - 3.7.4. Noncompliance notices
 - 3.8. Changes to the critical path and scheduled completion date since the last schedule submittal
 - 3.9. Reasons for an early or late scheduled completion date in comparison to the work completion date
 - 3.10. Written response to Engineer's comments on the previous month's schedule submittal

8-1.02B(2) Schedule Format

On each schedule, show:

1. Planned and actual start and completion dates of each work activity, including applicable:
 - 1.1. Submittal development.
 - 1.2. Submittal review and acceptance.
 - 1.3. Material procurement.
 - 1.4. Contract milestones and each required constraint. Constraints other than those required by the specifications may be included if authorized.
 - 1.5. Equipment and plant setup.
 - 1.6. Interfaces with outside entities.
 - 1.7. Erection and removal of falsework and shoring.
 - 1.8. Test periods.
 - 1.9. Major traffic stage change.
 - 1.10. Final cleanup.
2. Order that you propose to prosecute the work.
3. Logical links between the time-scaled work activities.
4. All controlling activities.
5. Clear description of each activity.
6. At least 1 predecessor and 1 successor to each activity except for project start and project end milestones.
7. Duration of at least 1 working day for each activity.
8. Start milestone date as the Contract approval date.

8-1.02B(3) Update Schedule

You may include changes to update schedules that do not alter a critical path or extend the scheduled completion date of the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing remaining durations
4. Changing logic

5. Your forecasted date of completion

In advance, discuss with the Engineer, changes that propose an adjustment of the scheduled completion date or alterations in the critical path. If agreement cannot be achieved, submit an RFI.

Meet with the Engineer to review work progress on or before the 1st day of each month, starting 30 days after the baseline schedule is accepted. Discuss, narrative report, progress to date, changes in schedule, unresolved time issues, and additional schedule changes needed.

The update schedule must:

1. Show actual activity start dates, percent complete, remaining duration, and finish dates
2. Show actual durations for work that has been completed, including the Engineer's review and your resubmittal times

If a previous update schedule was not approved, the Engineer may allow you to submit an update schedule that reflects current progress. Submittal of this update schedule does not result in acceptance of prior unaccepted schedules. Prior unaccepted schedules must be corrected and resubmitted upon request.

8-1.02C Level 2 Critical Path Method Schedule

8-1.02C(1) General

Section 8-1.02C applies to a contract if a bid item for a level 2 critical path method schedule is shown in the Bid Item List.

8-1.02C(2) Schedule Format

On each schedule, show:

1. Planned and actual start and completion dates of each work activity, including applicable:
 - 1.1. Submittal development.
 - 1.2. Submittal review and acceptance.
 - 1.3. Material procurement.
 - 1.4. Contract milestones and each required constraint. Constraints other than those required by the specifications may be included if authorized.
 - 1.5. Equipment and plant setup.
 - 1.6. Interfaces with outside entities.
 - 1.7. Erection and removal of falsework and shoring.
 - 1.8. Test periods.
 - 1.9. Major traffic stage change.
 - 1.10. Final cleanup.
2. Order that you propose to prosecute the work.
3. Logical links between the time-scaled work activities.
4. All controlling activities.
5. At least 50 but not more than 500 activities unless authorized. The number of activities must be sufficient to:
 - 5.1. Assure adequate planning of the project
 - 5.2. Permit monitoring and evaluation of progress
 - 5.3. Perform an analysis of time impacts
6. Clear description of each activity.
7. Alphanumeric activity identification and activity description system for labeling work activities.
8. Identification code for each activity for responsibility, stage, work shifts, location, and bid items.
9. At least 1 predecessor and 1 successor to each activity except for activities that begin at the project start milestone and activities that end at the project end milestone.
10. Activities durations of at least 1 working day and no more than 20 working days for each activity, unless otherwise authorized.
11. Start milestone date as the Contract approval date.
12. Department-owned float as the predecessor activity to the scheduled completion date.

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 or direction of highway, stage, lane number, shoulder, ramp name, ramp line descriptor, or mainline.

You may show early completion time on any schedule if you comply with the Contract. Early completion time is 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 show a scheduled completion date that is later than the work 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 included with the schedule submittal.

8-1.02C(3) Computer Software

Submit a description of your proposed schedule software for authorization.

Software must be compatible with the current version of the Microsoft Windows operating system in use by the Engineer.

The schedule software must be the latest version of Primavera P6 for Windows or equal.

Any proposed schedule software equal to Primavera P6 must be capable of:

1. Generating files that can be imported into Primavera P6
2. Comparing 2 schedules and providing reports of changes in activity ID, activity description, constraints, calendar assignments, start and finish dates, durations, and logic ties

8-1.02C(4) Data, Network Diagrams, Histograms, and Reports

For each schedule submittal, submit:

1. Schedule data in compatible Primavera P6 electronic file format. File name must include:
 - 1.1. Contract number
 - 1.2. Schedule number and date produced
2. 1 set of originally plotted, time-scaled network diagrams and a copy in PDF file format.
3. 1 copy of a narrative report in PDF file format.

The time-scaled network diagrams must:

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 critical path using graphical presentation
4. Be on 11 by 17 inches or larger sheets, unless otherwise authorized
5. Include a title block and a timeline on each page
6. Be in color

For resource allocated schedules, the time-scaled resource histograms must show materials, labor crafts and equipment classes anticipated to be used. For baseline schedule requiring resource allocation, use average composite crews to display the labor loading of job site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work and to assure that resources are not duplicated in concurrent activities.

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, 7-day work weeks, overtime, or work at times other than regular days or hours
4. Description of the current critical path
5. Current and anticipated delays, including:
 - 5.1. Cause of delay
 - 5.2. Impact of delay on other activities, milestones, and completion dates

- 5.3. Corrective action, mitigation, and schedule adjustments to correct the delay
6. Reasons for any changes you propose to the planned work
7. Pending items and status of:
 - 7.1. Permits
 - 7.2. Change orders
 - 7.3. Time adjustments
 - 7.4. Noncompliance notices
8. Changes to the critical path and scheduled completion date since the last schedule submittal
9. Reasons for an early or late scheduled completion date in comparison to the work completion date
10. Status of early completion time and Department-owned float, if applicable
11. Written response to Engineer's comments on the previous month's schedule submittal
12. For schedules requiring resource allocations, describe differences between actual resource allocations on activities and those anticipated in the baseline schedule.

8-1.02C(5) Preconstruction Scheduling Conference

Within 5 business days after Contract approval, submit a general time-scaled logic diagram showing the major activities and sequence of planned operations. If the Contract includes construction staging and you propose changes to the described staging, the general time scaled-logic diagram must show the changes and resulting time impacts. You may not perform work affected by the proposed changes to the described staging until the Engineer accepts your schedule and the Department approves a Change Order or provides an authorization to proceed ahead of the issuance of a change order.

Hold a preconstruction scheduling conference with your project manager and the Engineer within 10 days after Contract approval to discuss:

1. Your general time-scaled logic diagram
2. Any proposed changes to described staging
3. Proposed work plan and schedule methodology

At this conference, submit the alphanumeric coding structure and activity identification system for labeling work activities.

The Engineer conducts the preconstruction scheduling conference and reviews the schedule specification with you.

The Engineer provides any required baseline schedule changes to you for implementation within 2 business days of the preconstruction scheduling conference.

If you plan on submitting an early completion baseline schedule that shows work completion in less than 85 percent of the original working days, discuss planned resource allocations, number of crews, and equipment to achieve the early completion.

8-1.02C(6) Baseline Schedule

Starting the week after the preconstruction scheduling conference, meet with the Engineer weekly to discuss and resolve schedule issues until the baseline schedule is accepted. If you and the Engineer agree on the need for a third-party facilitated meeting to assist in resolving baseline schedule issues, the Department pays for 1/2 the cost of the facilitator; the Contractor pays for the other 1/2. The cost is determined under section 9-1.05 except no markup is allowed. If you and the Engineer cannot resolve baseline schedule issues, submit an RFI before starting work.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated.

The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical unless otherwise authorized.

The baseline schedule must not extend beyond the number of original working days.

The baseline schedule must have a data date of Contract approval.

If you submit an early completion baseline schedule that shows work completion in less than 85 percent of the original working days, the baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. 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.

8-1.02C(7) Update Schedule

You may include changes to update schedules that do not alter a critical path, add a near critical path, or extend the scheduled completion date compared to the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing remaining durations
4. Changing logic
5. Your forecasted date of completion

If any proposed change in planned work would alter the critical path or near critical path or extend the scheduled completion date, submit a TIA within 5 days of the proposed change.

Meet with the Engineer to review work progress on or before the 1st day of each month, starting 30 days after the baseline schedule is accepted. Discuss, narrative report, progress to date, changes in schedule, unresolved time issues, and additional schedule changes needed.

The update schedule must:

1. Show actual activity start dates, percent complete, and finish dates
2. Show durations for work that has been completed as the work occurred, including the Engineer's review and your resubmittal times
3. For instances where a baseline schedule requires resource allocations, describe actual resources allocated to activities for work that has been completed and those anticipated for remaining work.

If a previous update schedule was not approved, the Engineer may allow you to submit an update schedule that reflects current progress. Submittal of this update schedule does not result in acceptance of prior unaccepted schedules. Prior unaccepted schedules must be corrected and resubmitted upon request.

8-1.02C(8) Time Impacts

8-1.02C(8)(a) General

Reserved

8-1.02C(8)(b) Time Impact Analysis Submittal

Submit a TIA with each request for adjustment of Contract time or whenever you or the Engineer considers that an authorized or anticipated change may impact the critical path or work progress.

For a Change Order with deferred time, submit TIA updates monthly and within 15 days of completion of the change order work.

The TIA must:

1. Illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone such as those associated with incentives or disincentives for completion of work parts.
2. 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.
3. 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 2 schedules may be equal to the adjustment of Contract time. Mitigation measures must be considered before determining the final adjustment of Contract time.

The Engineer may construct and use an appropriate project schedule to determine adjustments in Contract time until you submit the TIA.

Submit 2 copies of the TIA within 10 days of receiving a written request for a TIA or within 5 business days of recognition of an authorized or anticipated change that may impact the critical path or work progress. Authorized TIA schedule changes must be shown on the next update schedule.

If a TIA you submit is rejected, meet with the Engineer within 5 business days of the rejection to discuss and resolve issues related to the TIA. If you are unable to resolve the issues, submit an RFI within 5 business days.

Show only actual as-built work in subsequent update schedules. Do not show unauthorized changes related to the TIA.

Upon completion of an unresolved time impact issue, submit a final time impact analysis for the Engineer to consider.

Once agreement is reached, the authorized TIA schedule changes must be shown on the next update schedule.

An ordered change that affects the critical path is a basis for a time adjustment.

The Department grants a time extension only if the total float is absorbed and the scheduled completion date is delayed 1 or more working days due to the ordered change. The Department may use Department-owned float to mitigate impacts of a Department ordered change.

8-1.02C(8)(c) Department-Owned Float

The Engineer may accrue Department-owned float. The Engineer documents Department-owned float by ordering you to update the Department-owned float activity on the next update schedule.

Include a log of the action on the Department-owned float activity and include a discussion of the action in the narrative report.

The Engineer may use Department-owned float to mitigate past, present, or future Department delays by offsetting a potential time extension for a Change Order.

Prepare a TIA upon request to determine the effect of Department-owned float. Department-owned float is a resource for the exclusive use of the Department.

8-1.02C(9) Final As-Built Schedule

Within 30 days after work completion, submit a final as-built schedule with actual start and finish dates for the activities.

Submit 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 as-built 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. In such an instance, include the written delegation with your submittals.

8-1.02C(10) Payment

The Department pays you for level 2 critical path method schedule as follows:

1. A total of 25 percent of the item total is paid upon:
 - 1.1. Completion of 5 percent of all work
 - 1.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 5 percent of all work is complete
2. A total of 50 percent of the item total is paid upon:
 - 2.1. Completion of 25 percent of all work
 - 2.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 25 percent of all work is complete

3. A total of 75 percent of the item total is paid upon:
 - 3.1. Completion of 50 percent of all work
 - 3.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 50 percent of all work is complete
4. A total of 100 percent of the item total is paid upon:
 - 4.1. Completion of all work
 - 4.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when all work is complete
 - 4.3. Submittal of the certified final as-built schedule

The Department does not adjust payment for any increased or decreased work in submitting schedules. The Department makes a deduction of \$25,000 for failure to submit the certified final as-built schedule.

8-1.02D–8-1.02F Reserved

Replace the row for Safety in the table in the 2nd paragraph of section 8-1.03 with:

Safety	10-19-18 Injury and Illness Prevention Program, Code of Safe Practices, and job site posters
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Add to the end of the 4th paragraph of section 8-1.05:

04-16-21

If you disagree with a Weekly Statement of Working Days report, submit an RFI within 5 business days of receipt of the report.

Replace the 2nd paragraph of section 8-1.07C with:

04-17-20

Losses for idle equipment, idle workers, and moving or transporting equipment are eligible for delay-related payment adjustments.

Replace item 3 in the list in the 3rd paragraph of section 8-1.07C with:

- 04-19-19
3. Delay days exclude Saturdays and holidays.

Add to section 8-1.07C:

04-17-20

If you claim additional costs due to impacts from an excusable delay, you must comply with section 5-1.42. Support your claim for additional costs based on the difference between the cost to perform the work as planned and the cost to perform the work as changed as determined under section 9-1.04. The Department adjusts payment for the work portion that was impacted.

Replace the 2nd paragraph of section 8-1.10A with:

10-15-21

The Department may withhold liquidated damages before the accrual date if the anticipated liquidated damages may exceed the value of the remaining work.

Replace the table in the 3rd paragraph of section 8-1.10A with:

10-15-21

Total bid		Liquidated damages per day
From over	To	
\$0	\$200,000	\$2,800
\$200,000	\$500,000	\$3,600
\$500,000	\$1,000,000	\$3,600
\$1,000,000	\$2,000,000	\$4,200
\$2,000,000	\$5,000,000	\$5,200
\$5,000,000	\$10,000,000	\$6,700
\$10,000,000	\$20,000,000	\$9,500
\$20,000,000	\$50,000,000	\$13,200
\$50,000,000	\$100,000,000	\$16,000
\$100,000,000	\$250,000,000	\$19,300

Replace section 8-1.14E with:

10-18-19

8-1.14E Payment Adjustment for Termination

If the Department issues a termination notice, the Engineer determines the payment for termination during the performance period, from contract approval date to contract acceptance date, based on the following:

1. Direct cost for the work performed:
 - 1.1. Including:
 - 1.1.1. Mobilization
 - 1.1.2. Demobilization
 - 1.1.3. Securing the job site for termination
 - 1.1.4. Losses from the sale of materials
 - 1.2. Not including:
 - 1.2.1. Cost of materials you keep
 - 1.2.2. Profit realized from the sale of materials
 - 1.2.3. Cost of material damaged by:
 - 1.2.3.1. Act of God
 - 1.2.3.2. Act of a public enemy
 - 1.2.3.3. Fire
 - 1.2.3.4. Flood.
 - 1.2.3.5. Governor-declared state of emergency
 - 1.2.3.6. Landslide
 - 1.2.3.7. Tsunami
 - 1.2.4. Other credits
2. Cost of remedial work, as estimated by the Engineer, is not reimbursed.
3. Allowance for profit not to exceed 4 percent of the cost of the work performed where a likelihood of having made a profit had the Contract not been terminated is shown.
4. Material handling costs for material returned to the vendor or disposed of as ordered.
5. Costs in determining the payment adjustment due to the termination, excluding attorney fees and litigation costs.
6. Overhead costs.

Termination of the Contract does not relieve the surety of its obligation for any just claims arising out of the work performed.

AA

9 PAYMENT

04-15-22

Add between the 1st and 2nd paragraphs of section 9-1.04A:

04-17-20

The Tentative Daily Extra Work Agreement form is used to identify the labor, materials, and equipment used on change order work paid at force account. Signatures on this form do not constitute final agreement regarding payment.

Replace the 2nd paragraph of section 9-1.06B with:

10-16-20

If the payment for the number of units of a bid item in excess of 125 percent of the Bid Item List is less than \$15,000 at the unit price, the Engineer may not adjust the unit price unless you request it.

Replace section 9-1.07B(5) with:

10-19-18

9-1.07B(5) Hot Mix Asphalt Containing Reclaimed Asphalt Pavement

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

$$Q_{rap} = HMARTT \times X_{aa}$$

where:

$$X_{aa} = X_{ta} - [(X_{rap} \times X_{ra} \times (X_{ta} - 100)) / (100 \times (X_{ra} - 100))]$$

and:

Q_{rap} = quantity in tons of asphalt used in HMA containing RAP

$HMARTT$ = HMA containing RAP, total tons placed

X_{aa} = asphalt content of HMA containing RAP adjusted to exclude the asphalt content in RAP, expressed as a percentage of the total weight of HMA containing RAP

X_{ta} = total theoretical asphalt content in HMA containing RAP from the job mix formula, expressed as a percentage of the total weight of HMA containing RAP

X_{rap} = RAP percentage in HMA containing RAP from the job mix formula, expressed as a percentage of the total dry weight of aggregate in HMA containing RAP

X_{ra} = average asphalt content of RAP from the job mix formula, expressed as percentage of total weight of RAP

Replace item 1.2 in the list in the 2nd paragraph of section 9-1.11C with:

04-16-21

1.2. Superintendents

Replace the 2nd sentence in the 7th paragraph of section 9-1.11E with:

04-19-19

The cost is determined under section 9-1.05 except no markup is allowed.

04-15-22

Delete the 2nd paragraph of section 9-1.16A.

Replace section 9-1.16C with:

10-19-18

9-1.16C Materials On Hand

A material on hand but not incorporated into the work is eligible for a progress payment if:

1. Compliant with other Contract parts
2. Material cost exceeds either of the following:
 - 2.1. \$50,000
 - 2.2. \$25,000 if the requestor is certified as one or more of the following:
 - 2.2.1. DVBE
 - 2.2.2. DBE
 - 2.2.3. Small business as certified by Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Services
3. Purchased
4. Invoice is submitted
5. Stored within the State and you submit evidence that the stored material is subject to the Department's control
6. Protected from weather and contamination
7. Water pollution control measures are established and maintained
8. Requested on the Department-furnished form

Replace the 1st paragraph of section 9-1.16E(3) with:

10-18-19

During each estimate period you fail to comply with a Contract part, including the submittal of a document as specified, such as QC plans, schedules, traffic control plans and water pollution control submittals, the Department withholds a part of the progress payment except as specified below for the failure to submit a document during the last estimate period.

Replace section 9-1.16F with:

04-16-21

9-1.16F Retentions

The Department does not retain moneys from progress payments due to the Contractor for work performed.

Replace the 3rd paragraph of section 9-1.17C with:

10-18-19

If you claim that the total for work completed, excluding deductions, in the proposed final estimate is less than 90 percent of your total bid, the Department adjusts the final payment to cover your overhead. The adjustment in the final estimate is 10 percent of the difference between 90 percent of your total bid and the total for work completed, excluding deductions. The Department does not make this adjustment on a terminated contract.

Replace section 9-1.17D(2)(b) with:

04-17-20

9-1.17D(2)(b) Overhead Claims

9-1.17D(2)(b)(i) General

Section 9-1.17D(2)(b) includes specifications for overhead claims.

The Department deducts an amount for field and home office overhead paid on added work from any claim for overhead. The home office overhead deduction equals 5 percent of the added work. The field office overhead deduction equals 5-1/2 percent of the added work.

9-1.17D(2)(b)(ii) Definitions

actual daily overhead rates: The home office overhead and field office overhead rates expressed per business day for the contract performance period. The home office overhead rate is calculated using the Eichleay Formula and is based on overhead cost pools and all allocation bases from Contract and company revenues.

added work: Equals the value of the work completed minus the total bid.

contract performance period: The period from Contract approval to Contract acceptance.

9-1.17D(2)(b)(iii) Submittals

Submit the following for an overhead claim:

1. Final amount of additional payment requested.
2. Specific identification of each claim and dates associated with each claim for which you seek reimbursement for specific overhead costs.
3. Audit report prepared by an independent CPA for the contract performance period identifying the actual daily overhead rates, supporting calculations and documentation for both field and home office overhead excluding a profit markup.

Field office overhead costs from which the actual daily overhead rate is calculated must be:

1. Allowable under 48 CFR 31
2. Supported by reliable records
3. Related solely to the project
4. Incurred during the contract performance period
5. Comprised of only time-related field office overhead costs
6. Not a direct cost

Home-office overhead costs from which the actual daily overhead rate is calculated must be:

1. Allowable under 48 CFR 31
2. Supported by reliable records
3. Incurred during the contract performance period
4. Comprised of only fixed home-office overhead costs
5. Not a direct cost

Failure to submit the audit report for an overhead claim with the claim statement is a waiver of the overhead claim and operates as a bar to arbitration on the claim (Pub Cont Code § 10240.2).

The CPA's audit must be performed as an examination-level engagement under the attestation engagements in the *Government Auditing Standards* published by the Comptroller General of the United States. The CPA's audit report must express an opinion of whether or not your calculations of your actual field and home office overhead daily rates comply with section 9-1.17D(2)(b). The attest documentation prepared by the CPA in connection with the audit must be submitted for review with the audit report.

Within 20 days of the Engineer's request, make your financial records available for an audit by the State for verifying the actual daily overhead rates in your audit report. The actual rate of time-related overhead is subject to authorization by the Engineer.

The Department pays for 1/2 the cost of the report unless otherwise specified. The cost is determined under section 9-1.05 except no markup is allowed.

Replace the 3rd and 4th paragraphs of section 9-1.17D(3) with:

04-16-21

If the Engineer determines that a claim requires additional analysis, the Engineer schedules a Department management meeting. Meet with Department management and make a presentation supporting the claim.

Replace the 1st paragraph of section 11-1.05 with:

04-16-21

Replace the first sentence of clause 7.21.1.1 of AWS D1.1 with the following:

The separation between surfaces of plug and slot welds, and of joints landing on a backing, shall not exceed 1/16 in [2 mm].

Replace clause 5.3.1.1 of AWS D1.5 with the following:

The separation between surfaces of plug and slot welds, and of joints landing on a backing, shall not exceed 2 mm [1/16 in].

If weld joint details proposed for use in the work are not prequalified under clause 5 of AWS D1.1 or figure 4.4 or 4.5 of AWS D1.5, submit the proposed WPS and the intended weld joint locations.

Replace item 2 in the list in the 2nd paragraph of section 11-1.05 with:

04-19-19

2. Be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria must comply with the applicable AWS codes. The type of mechanical testing must be authorized.

Replace the 3rd paragraph of section 11-1.05 with:

10-16-20

If a nonprequalified weld joint configuration is proposed using a combination of WPSs for work welded under AWS D1.1, you may conduct a single test combining the WPSs to be used in production, if the essential variables, including weld bead placement, of each process are limited to those established in table 6.5 of AWS D1.

Replace the 1st and 2nd paragraphs of section 11-1.06 with:

04-16-21

Replace item 3 of clause 8.26.3.2 of AWS D1.5 with:

3. If indications that exhibit these planar characteristics are present at scanning sensitivity, or other evidence exists to suggest the presence of transverse cracks, a more detailed evaluation of the discontinuity by other means must be performed (e.g., alternate UT techniques, RT, grinding, or gouging for visual inspection or MT of the excavated areas.)

Replace the scanning angle in clause 8.24.2.2 of AWS D1.5 with:

$e = 45^\circ \text{ max}$

Clause 8.6.5 of AWS D1.1, clause 9.6.5 of AWS D1.4, and clause 8.6.5 of AWS D1.5 do not apply.

Replace the introductory clause of the 1st paragraph of section 11-2.04 with:

04-16-21

Clauses 8.1.4.2 and 8.1.4.4 of AWS D1.1, the 2nd paragraph of clause 9.1.2 of AWS D1.4, clauses 8.1.3.1 through 8.1.3.3 of AWS D1.5, and clause 7.2.3 of AWS D1.8 are replaced with:

Temporary traffic control, including flagging, apparel, temporary traffic control devices, and equipment for flaggers, must comply with the *California MUTCD*, Part 6, "Temporary Traffic Control."

12-1.02 MATERIALS

Not Used

12-1.03 CONSTRUCTION

Assign flaggers to:

1. Control traffic
2. Warn the public of any dangerous conditions resulting from the work activities
3. Provide for the passage of traffic through the work as specified for the passage of traffic for public convenience and public safety

Maintain flagging apparel, traffic control devices, and equipment for flaggers in good repair.

12-1.04 PAYMENT

Not Used

12-2 RESERVED

12-3 TEMPORARY TRAFFIC CONTROL DEVICES

12-3.01 GENERAL

12-3.01A General

12-3.01A(1) Summary

Section 12-3.01 includes general specifications for providing temporary traffic control devices.

10-15-21

Providing temporary traffic control devices includes installing, placing, maintaining, repairing, replacing, relocating, and removing temporary traffic control devices.

10-18-19

Do not use different types of channelizing devices on the same alignment. The types include plastic drums, portable delineators, channelizers, tubular markers, traffic cones, and Type I and Type II barricades.

12-3.01A(2) Definitions

Category 1 temporary traffic control devices: Small devices weighing less than 100 lb certified as crashworthy by crash testing or crash testing of similar devices. Category 1 temporary traffic control devices include traffic cones, plastic traffic drums, portable delineators, and channelizers.

Category 2 temporary traffic control devices: Small devices weighing less than 100 lb that are not expected to produce significant changes in vehicular velocity but could cause harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

10-15-21

Category 3 temporary traffic control devices: Devices weighing 100 lb or more that are expected to produce significant changes in the vehicular velocity of impacting vehicles. These devices include crash cushions, impact attenuator vehicles, temporary barriers, and end treatments for barriers.

10-18-19

orange: Orange, red-orange, fluorescent orange, or fluorescent red-orange.

useable shoulder area: Any longitudinal paved or unpaved contiguous surface adjacent to the traveled way with:

1. Enough weight-bearing capacity to support temporary traffic control devices, such as flashing arrow signs, PCMSs, and impact attenuator vehicles
2. Slope not greater than 6:1 (horizontal:vertical)

12-3.01A(3) Submittals

At least 5 business days before starting any work using the devices or within 2 business days after the request if the devices are already in use, submit as informational submittals:

1. Self-certification for crashworthiness of Category 1 temporary traffic control devices. Either you or the manufacturer must perform the self-certification. Include:
 - 1.1. Date
 - 1.2. Federal aid number for a federal-aid contract
 - 1.3. Contract number, district, county, route, and post miles of the project limits
 - 1.4. Company name, street address, city, state, and zip code of the certifying vendor
 - 1.5. Printed name, signature, and title of the certifying person
 - 1.6. Types of Category 1 temporary traffic control devices
2. List of proposed Category 2 temporary traffic control devices

Obtain a standard form for self-certification from the Engineer.

Submit a sample of the type of portable delineator that you will be using before placing the delineators on the job site.

12-3.01A(4) Quality Assurance

Reserved

12-3.01B Materials

The condition of temporary traffic control devices must comply with the most current edition of the American Traffic Safety Services Association publication *Quality Guidelines for Temporary Traffic Control Devices and Features*.

Category 2 temporary traffic control devices must be on FHWA's list of acceptable crashworthy Category 2 hardware for work zones. For this list, go to FHWA's Safety Program website.

Category 2 temporary traffic control devices must be labeled with the FHWA acceptance letter code and the name of the manufacturer. The label must be legible and permanently affixed to the temporary traffic control device by the manufacturer.

Category 3 temporary traffic control devices must be on the Authorized Material List for highway safety features.

Retroreflectivity for the following materials must comply with Table 2A-3, "Minimum Maintained Retroreflectivity Levels," of the *California MUTCD* and be on the Authorized Material List for signing and delineation materials:

1. Retroreflective sheeting for barricades
2. Retroreflective bands for portable delineators
3. Retroreflective sheeting for construction area signs
4. Retroreflective sheeting for channelizers
5. Reflectors for Type K temporary railing
6. Retroreflective cone sleeves
7. White and orange retroreflective stripes for plastic traffic drums

The following temporary traffic control devices must be visible from 1,000 feet during the hours of darkness under an illumination of legal high-beam headlights by persons with 20/20 vision or vision corrected to 20/20:

1. Retroreflective bands on portable delineators
2. Retroreflective sheeting on channelizers
3. Retroreflective cone sleeves on traffic cones

12-3.01C Construction

Perform all layout work necessary to place channelizing devices:

1. On the proper alignment

2. Uniformly at the location and spacing described
3. Straight on a tangent alignment
4. On a true arc in a curved alignment

If temporary traffic control devices are damaged, displaced, or stop operating or functioning as described from any cause during the progress of the work, immediately repair, repaint, or replace the components and restore them to their original locations and positions.

If ordered, furnish and place additional temporary traffic control devices. This work is change order work unless the temporary traffic control devices are being furnished and placed for public safety or public convenience.

Level and plumb a portable system.

Delineate the location of a trailer mounted system with a taper consisting of 9 traffic cones placed 25 feet apart, except where the system is placed within a lane closure or behind a barrier or guardrail.

When a portable system is not in use, remove it from the job site, place it behind a barrier or guardrail, or move it to an area at least 15 feet from the edge of the traveled way.

10-15-21

12-3.01D Payment

Payment for a system with a DAY unit of measure is based on a continuous 24-hour period. The 24-hour period will start when the system is placed in operation at the first location.

10-18-19

12-3.02 TRAFFIC CONES

12-3.02A General

Section 12-3.02 includes specifications for placing traffic cones.

12-3.02B Materials

A traffic cone must be flexible, orange, and manufactured from commercial-quality material designed for the intended purpose.

The outer section of the portion above the base of the traffic cone must be translucent and fabricated of a highly pigmented, orange, PV compound. The overall height of a traffic cone must be at least 28 inches and the bottom inside diameter of the traffic cone must be at least 10.5 inches.

During the hours of darkness, a traffic cone must have a retroreflective cone sleeve.

Retroreflective cone sleeves must be permanently affixed, double-band, sleeves consisting of 2 white retroreflective bands. The top band must be 6 inches wide and placed a maximum of 4 inches from the top of the cone. The lower band must be 4 inches wide and placed 2 inches below the bottom of the top band. You may use traffic cones with double-band retroreflective cone sleeves during daylight hours.

12-3.02C Construction

Use the same type of retroreflective cone sleeve for all cones used on the project.

Anchor the base of a traffic cone if it does not have enough size and weight to keep the cone in an upright position.

12-3.02D Payment

Not Used

12-3.03 PLASTIC TRAFFIC DRUMS

12-3.03A General

12-3.03A(1) Summary

Section 12-3.03 includes specifications for placing plastic traffic drums.

12-3.03A(2) Definitions

Reserved

12-3.03A(3) Submittals

Submit a certificate of compliance for plastic traffic drums.

12-3.03A(4) Quality Assurance

Reserved

12-3.03B Materials

A plastic traffic drum must comply with the manufacturer's instructions for weight and ballast.

A plastic traffic drum must:

1. Be orange LDPE
2. Be flexible and collapsible upon vehicle impact
3. Have a weighted base to maintain an upright position and prevent displacement by passing traffic
4. Have a height such that the top of the drum is at least 36 inches above the traveled way

The weighted base must:

1. Be detachable
2. Be shaped to prevent rolling upon impact
3. Have a 38-inch maximum outside diameter
4. Have a 4-inch maximum height above the ground surface

12-3.03C Construction

Use 1 type of plastic traffic drum on the project.

Use the same type and brand of retroreflective sheeting for all plastic traffic drums used on the project.

Do not use sandbags or comparable ballast.

Moving plastic traffic drums from location to location if ordered after initial placement is change order work.

12-3.03D Payment

Not Used

12-3.04 PORTABLE DELINEATORS

12-3.04A General

Section 12-3.04 includes specifications for placing portable delineators.

12-3.04B Materials

A portable delineator, including its base, must be made of a material that has enough rigidity to remain upright when unattended and must be flexible or collapsible upon impact by a vehicle. The base must be (1) shaped to prevent rolling after impact and (2) anchored or weigh enough to keep the delineator in an upright position. Ballast for a portable delineator must comply with the manufacturer's instructions.

A portable delineator must be a minimum of 36 inches in height. The vertical portion of a portable delineator must be predominantly orange. The post must be not less than 3 inches in width or diameter. Retroreflectorization of a portable delineator that has a height of less than 42 inches must be provided by two 3-inch-wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of a portable delineator that has a height of 42 inches or more must be provided by four 4- to 6-inch-wide alternating orange and white stripes with the top stripe being orange.

12-3.04C Construction

Use only 1 type of portable delineator on the project.

12-3.04D Payment

Not Used

12-3.05 CHANNELIZERS

12-3.05A General

Section 12-3.05 includes specifications for placing channelizers.

12-3.05B Materials

A channelizer must be on the Authorized Material List for signing and delineation materials.

Its post must be orange.

A channelizer must be affixed with 3-by-12-inch, retroreflective, white sheeting.

12-3.05C Construction

Install channelizers on clean, dry surfaces.

Cement the channelizer bases to the pavement as specified for cementing pavement markers to the pavement in section 81-3.

When no longer required for the work, remove the channelizers and the underlying adhesive used to cement the channelizer bases to the pavement.

Do not remove channelizers that are shown to be left in place at the time of work completion.

12-3.05D Payment

Not Used

12-3.06–12-3.09 RESERVED

12-3.10 BARRICADES

12-3.10A General

Section 12-3.10 includes specifications for placing barricades.

12-3.10B Materials

Markings for barricade rails must be alternating orange and white retroreflective stripes.

Orange retroreflective sheeting must match color PR no. 6, Highway Orange, of the FHWA Color Tolerance Chart.

The interface between the rail surface and the retroreflective sheeting must be free of air bubbles or voids.

The predominant color of barricade components other than the rails must be white or unpainted galvanized metal or aluminum.

You may use a Type III barricade as a sign support if the barricade has been successfully crash tested under *NCHRP Report 350* criteria or the Manual for Assessing Safety Hardware (MASH) crash testing guidelines as a single unit with an attached sign panel of the size and type to be used.

A sign panel for a construction area sign or marker panel to be mounted on a barricade must comply with section 12-3.11B(2).

Do not imprint an owner identification on the retroreflective face of any rail.

12-3.10C Construction

Place each barricade such that the stripes slope downward in the direction road users are to pass.

Place each sand-filled bag near the ground level on the lower parts of the frame or stays to serve as ballast for the barricades. Do not place ballast on top of barricades or over any retroreflective barricade rail face that is facing traffic.

Do not remove barricades that are shown to be left in place at the time of work completion.

Moving a barricade from location to location is change order work if ordered after initial placement of the barricade.

12-3.10D Payment

Not Used

12-3.11 CONSTRUCTION AREA SIGNS

12-3.11A General

12-3.11A(1) Summary

Section 12-3.11 includes specifications for placing construction area signs.

04-17-20

Construction area signs include general information signs and all temporary signs and object markers required for the direction of traffic within the project limits.

10-18-19

12-3.11A(2) Definitions

background: Dominant sign color.

legend: Letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters that are intended to convey specific meanings on traffic signs.

12-3.11A(3) Submittals

Reserved

12-3.11A(4) Quality Assurance

Reserved

12-3.11B Materials

12-3.11B(1) General

04-17-20

Construction area sign must be the product of a commercial sign manufacturer.

10-18-19

The style, font, size, and spacing of the legend must comply with the *Standard Alphabets* published in the FHWA's Standard Highway Signs Book.

The sign must be visible from 500 feet and legible from 300 feet at noon on a cloudless day and during the hours of darkness under an illumination of legal low-beam headlights by persons with 20/20 vision or vision corrected to 20/20. A fabric sign panel on a portable sign is not subject to the visibility and legibility requirements for headlight illumination during the hours of darkness.

04-16-21

Construction area warning and guide signs must have a black legend on a retroreflective, fluorescent orange background. W10-1 advance warning sign for highway-rail grade crossings must have a black legend on a retroreflective fluorescent yellow background.

10-18-19

12-3.11B(2) Stationary-Mounted Signs

04-16-21

Stationary-mounted sign must comply with section 82-2.

10-18-19

A temporary sign support of any type placed within 15 feet from the edge of the traveled way must comply with the specifications for a Category 2 temporary traffic control device.

The sign post must be good, sound wood posts with the breakaway feature as shown for a roadside sign.

Fastening hardware and back braces must be commercial-quality materials.

12-3.11B(3) Portable Signs

Each portable sign must consist of a base, standard or framework, and a sign panel. Units delivered to the job site must be capable of being placed into immediate operation.

A sign panel for a portable sign must comply with the specifications for a stationary-mounted sign panel or be fabricated from one of the following materials:

1. Type VI, retroreflective, elastomeric roll-up fabric
2. Nonretroreflective, cotton, drill fabric
3. Nonretroreflective, flexible, industrial, nylon fabric
4. Another type of fabric if authorized

Do not use nonretroreflective portable signs during the hours of darkness.

The bottom of the portable sign panel must be at least 1 foot above the edge of the traveled way.

12-3.11B(4) Temporary Object Markers

A temporary object marker must be mounted on a stationary wood or metal post and must comply with section 82.

A marker panel for a Type N (CA), Type P (CA), or Type R (CA) object marker must comply with the specifications for a marker panel for a stationary sign panel in section 12-3.11B(2).

A target plate, post, and the hardware for a Type K (CA) and Type L (CA) temporary object marker must comply with the specifications for these items in section 82.

12-3.11B(5) General Information Signs

10-16-20

12-3.11B(5)(a) General

Not Used

04-16-21

12-3.11B(5)(b) Construction Project Funding Identification Signs

Construction project funding identification sign must:

1. Comply with:
 - 1.1. Section 6F.109(CA) of the California MUTCD
 - 1.2. Section 82-2.02E
 - 1.3. Specifications on the Department's Safety Programs website
2. Be 48 by 30 inches for local roadways
3. Be 96 by 60 inches for conventional highways
4. Be 132 by 78 inches for freeways and expressways

10-18-19

12-3.11C Construction

12-3.11C(1) General

Place all construction area signs outside of the traveled way. Do not block a bicycle or pedestrian pathway with a construction area sign.

Place, install, maintain, and remove temporary object markers shown as construction area signs as specified for construction area signs.

Maintain accurate information on construction area signs. Immediately replace or correct signs that convey inaccurate information.

During the progress of work, immediately cover or remove unneeded signs.

Cover each unneeded sign such that the message cannot be seen. Securely fasten the cover to prevent movement from wind.

Check each covered sign daily for damage to the cover and immediately replace any cover if needed.

Clean each construction area sign panel at the time of installation and at least once every 4 months thereafter.

Be prepared to furnish additional construction area sign panels, posts, and mounting hardware or portable sign mounts on short notice due to changing traffic conditions or damage caused by traffic or other conditions. Maintain an inventory of commonly required items at the job site or make arrangements with a supplier who is able to furnish the items daily on short notice.

Replace any damaged construction area sign or repair the sign if authorized.

Remove any sign panel that exhibits irregular luminance, shadowing, or dark blotches at nighttime under vehicular headlight illumination.

12-3.11C(2) Stationary-Mounted Signs

Install stationary-mounted signs as described for the installation of roadside signs except:

1. Back braces and blocks for sign panels are not required for signs 48 inches or smaller in width and diamond-shaped signs 48 by 48 inches or smaller.
2. Bottom of the sign panel must be at least 7 feet above the edge of the traveled way.
3. You may install a construction area sign on an above-ground, temporary platform sign support or on an existing lighting standard or other support if authorized. Do not make holes in a standard to support the sign if it is installed on an existing lighting standard.
4. Post embedment must be at least 2.5 feet if the post hole is backfilled around the post with commercial-quality concrete. The concrete must contain at least 295 pounds of cementitious material per cubic yard.

The Engineer determines the post size and number of posts if the type of sign installation is not shown.

Excavate each post hole by hand methods without the use of power equipment. You may use power equipment where you determine that subsurface utilities are not present in the area of the proposed post hole if authorized. The post-hole diameter must be at least 4 inches greater than the longest cross-sectional dimension of the post if it is backfilled with commercial-quality concrete.

Furnishing, installing, maintaining, moving, and removing any additional construction area signs if ordered is change order work.

12-3.11C(3) General Information Signs

12-3.11C(3)(a) General

Not Used

10-16-20

12-3.11C(3)(b) Construction Project Funding Identification Signs

Do not add information to a construction project funding identification sign unless authorized.

Install construction project funding identification signs before starting major work activities visible to highway users.

Mount construction project funding identification signs on a wood posts under section 82-3.

04-16-21

12-3.11D Payment

Not Used

10-18-19

12-3.12 TELESCOPING FLAG TREES

12-3.12A General

Section 12-3.12 includes specifications for placing telescoping flag trees.

12-3.12B Materials

Telescoping flag trees must be manufactured from commercial-quality material designed for the intended purpose and capable of maintaining an upright position at all times while in use.

12-3.12C Construction

Not Used

12-3.12D Payment

Not Used

12-3.13–12-3.19 RESERVED

10-15-21

12-3.20 TEMPORARY BARRIER SYSTEMS

12-3.20A General

12-3.20A(1) Summary

Section 12-3.20 includes specifications for placing, maintaining, repairing, and removing temporary barrier systems.

Temporary barrier system consists of:

1. New or undamaged used interconnected barrier segments
2. Segment connection hardware
3. Stakes and anchor bolts

12-3.20A(2) Definitions

clear area width: Minimum width throughout the length of the barrier system that must be maintained clear of obstructions, objects, and work resources during non-working hours. The width is measured perpendicular from the non-traffic side toe.

set back distance: Space measured between the closest toe of temporary barrier and the edge of traveled way for both directions of traffic.

12-3.20A(3) Submittals

Submit as informational submittal for each type of temporary barrier system:

1. Certificate of compliance
2. Manufacturer's installation instructions except for Type K temporary railing

Submit a signed manufacturer's replacement evaluation report within 10 days of damage to a temporary steel barrier system.

12-3.20A(4) Quality Assurance

12-3.20A(4)(a) General

Except for Type K temporary railing, temporary barrier systems must:

1. Be on the Authorized Materials List for highway safety features
2. Comply with MASH Test Level 3 requirements
3. Comply with the manufacturer's drawings shown on the Department's Division of Safety Programs website and the manufacturer's installation instructions

If a discrepancy exists, governing ranking in descending order is:

1. These specifications
2. Manufacturer's drawings
3. Manufacturer's installation instructions

12-3.20A(4)(b) Quality Control

Replace damaged temporary concrete barrier segments with exposed reinforcing steel or concrete spalls 1-1/2 inches in depth and 4 inches in width or greater.

Replace damaged temporary steel barrier segments with permanent bends, tearing, or buckling as described in the signed manufacturer's replacement evaluation report.

Realign temporary barrier system within 2 days of impact or displacement when displaced more than 3 inches.

12-3.20B Materials

12-3.20B(1) General

Temporary barrier segment must:

1. Be a minimum 31-1/2 inches in height
2. Have at least two lifting holes
3. Be designed to be used with temporary traffic screen when required

Temporary barrier segment may have your name or logo on each barrier segment. The name or logo must be no more than 4 inches in height and must be located no more than 12 inches above the bottom of the barrier segment.

12-3.20B(2) Temporary Concrete Barriers

12-3.20B(2)(a) General

Temporary concrete barrier segment must:

1. Be precast concrete with a minimum 4,000-psi compressive strength.
2. Have reinforcement steel that complies with section 52.
3. Have a finished surface that complies with section 51-1.03F(2).
4. Comply with the requirements for precast concrete.
5. Include the manufacturer's name, lot number, and month and year of manufacture stamped on the top of each barrier segment except for Type K temporary railing. The stamped information must be:
 - 5.1. No more than 6 inches in height.
 - 5.2. No more than 12 inches in length.
 - 5.3. From 3/16 to 1/4 inch in depth.
 - 5.4. Centered on the top width of the barrier segment.

Segment connection hardware must be one of the following:

1. Steel bar loops and connecting pins
2. "J" hook steel plates

Steel bar loops must comply with ASTM A36/A36M.

Connecting pins must comply with ASTM A307. A round bar of the same diameter may be substituted for the connecting pins. The round bar must:

1. Comply with ASTM A36/A36M
2. Have a minimum length of 26 inches
3. Have a 3-inch-diameter, 3/8-inch-thick plate welded on the upper end using a 3/16-inch fillet weld

"J" hook steel plates must be a minimum 18 inches in height.

12-3.20B(2)(b) Temporary Concrete Barrier with "J" Hooks

The steel stakes must be 1-1/2 inches in diameter and 48 inches long.

Anchor hardware must include:

1. 1-inch-diameter, 6-inch-long anchor bolt insert
2. 1-inch-diameter hex head bolt with a minimum length of 11 inches plus thickness of asphalt overlay
3. 3-by-3-by-3/8-inch plate washer
4. Retainer ring

12-3.20B(2)(c) Type K Temporary Railing

Reserved

12-3.20B(2)(d)–12-3.20B(2)(g)

Reserved

12-3.20B(3) Temporary Steel Barriers

Temporary steel barriers segment must:

1. Be galvanized steel.
2. Comply with ASTM A36.
3. Have a joint connection.
4. Include permanent identification information with no more than 6 inches in height and 12 inches in length and centered on the top width of the segment. The identification information must include:
 - 4.1. Manufacturer's name.
 - 4.2. Serial number.
 - 4.3. Lot number.
 - 4.4. Month and year of manufacture.

12-3.20B(4)–12-3.20B(9)

Reserved

12-3.20B(10) Temporary Terminal Sections

Reserved

12-3.20C Construction

12-3.20C(1) General

Clean temporary barrier segments at time of installation and at least every 6 months thereafter.

Install the temporary barrier system based on the requirements shown in the following table:

Minimum Clear Area Width

Barrier	Configuration	Height differentials 3 feet or less (ft)	Height differentials greater than 3 ft up to 8 feet (ft)	Edge of deck or height differentials greater than 8 feet (ft)	Fixed objects, falsework members, or temporary supports ^a (ft)
12'-6" temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	3 stakes per segment traffic side	1	1	2	3
	2 anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	4 stakes per segment traffic side	1	1	2	3
	3 anchor bolts per segment traffic side	1	1	2	3
50-foot temporary steel barrier	Staked or anchored at both ends only	6	7	9	10
	Staked or anchored every 250 feet	5	6	8	9
	Staked or anchored every 33 feet	1	1	3	4
20-foot Type K temporary railing	Freestanding	2	3	8	7
	2 stakes or 2 anchor bolts per segment traffic side	1	1	3	4
	4 stakes or 4 anchor bolts per segment	N/A	N/A	3	3

^aThe minimum clear area width to a falsework or temporary support footing can be 2 feet less than the clear area width shown. Measure clear area width to the footing edge closest to traffic.

Stake down temporary barrier systems when placed on an asphalt concrete surface.

Anchor down temporary barrier systems when placed on a concrete surface. For bridge decks, confirm the anchor will not penetrate closer than 1-1/2 inches from the bottom of the deck before placement. When temporary barrier is not shown, request the Engineer to verify the bridge deck thickness.

For installations on concrete surfaces, drill holes and bond threaded rods or dowels under section 51-1. Do not drill the top of supporting beams or girders, bridge expansion joints, or drains.

Install stakes and anchor bolts so the heads do not project above the top of the temporary barrier pocket profile.

Install a reflector on the top or face of barrier segments placed within 10 feet of a traffic lane. Space reflectors at approximately 20-foot intervals. Apply adhesive for mounting the reflector under the reflector manufacturer's instructions.

Install a Type P marker panel complying with section 82 at each end of temporary barrier system placed adjacent to a two-lane, two-way highway and at the end facing traffic for temporary barrier installed adjacent to a one-way roadbed. If the temporary barrier is placed on a skew, install the marker at the end of the skew nearest the traveled way.

Maintain a minimum height of 31-1/2 inches above surface for temporary barrier. For paving activities adjacent to temporary barrier, do not pave within 2 feet of the barrier segments unless authorized. For paving under the temporary barrier, remove and reset the barrier.

Remove stakes and anchor bolts so that minimal damage is done to surface.

After removing the temporary barrier systems:

1. Restore the area to its previous condition or construct it to its planned condition if temporary excavation or embankment was used to accommodate the temporary barrier.
2. Remove all threaded rods or dowels to a depth of at least 1 inch below the top of a concrete surface. Fill the resulting holes with mortar under section 51-1 except cure the mortar by the water method or by the curing compound method using curing compound no. 6.
3. Repair a damaged asphalt surface by providing a clean, smooth edge around the damaged area. Repair any heaving caused by stake removal to provide a uniform surface. Remove loose debris and use compressed air to clean out the stake hole. Comply with manufacturer's requirements except fill the stake hole with grout to existing pavement elevation under section 51-1.

If the Engineer orders a lateral move of a temporary barrier system and repositioning is not shown, the lateral move is change order work except for work area access, clear area width compliance, or because of your means and methods to perform the work.

12-3.20C(2) Temporary Concrete Barriers

12-3.20C(2)(a) General

Before placing temporary concrete barrier on the job site and after each described relocation, paint the exposed surfaces of the segments with white paint complying with specifications for acrylic emulsion paint for exterior masonry.

Place and maintain the abutting ends of segments in alignment without substantial offset from each other.

Install temporary barrier systems with the last segment extending a minimum of 60 feet past the length of the protected area.

12-3.20C(2)(b) Temporary Concrete Barrier with "J" Hooks

Install a minimum 200 feet of temporary concrete barrier with "J" hooks.

Place the temporary barrier system on a concrete or asphalt concrete surface. The asphalt concrete surface must have a minimum 2 inches of asphalt concrete over 6 inches of compacted subbase.

Install two parallel temporary barrier systems, one for each direction of travel, when placed between two-way traffic. Maintain the minimum clear area as shown in the table titled "Minimum Clear Area Width" between the two systems. Maintain a minimum 1-foot set back distance.

12-3.20C(2)(c) Type K Temporary Railing

Do not install Type K temporary railing on projects advertised after December 31, 2026.

Install a minimum 160 feet of Type K temporary railing.

Excavate and backfill under section 19-3.

Do not compact earth fill placed behind Type K temporary railing in a curved layout.

Place temporary barrier system on a firm, stable surface. Grade the area to provide a uniform bearing surface throughout the entire length of the system.

Anchor or stake down each end segment and every other segment with four stakes as shown when placed between two-way traffic. Maintain a minimum 1-foot set back distance.

12-3.20C(2)(d)–12-3.20C(2)(g)

Reserved

12-3.20C(3) Temporary Steel Barriers

12-3.20C(3)(a) General

Reserved

12-3.20C(3)(b) 50-Foot Temporary Steel Barriers

Use 50-foot temporary steel barriers with or without rubber pads.

Install a minimum 250 feet of 50-foot temporary steel barrier. The last segment must extend a minimum 25 feet past the length of the protected area.

Place the temporary barrier system on a concrete or asphalt concrete surface. Do not place the system on a dirt or earth surface.

Anchor or stake down the first and last segment of the temporary barrier system.

Maintain a minimum radius of 800 feet for segments placed on a curved layout. For tighter curves down to a 250-foot radius, contact the manufacturer before installation and provide manufacturer's written recommendation for the installation.

Maintain a minimum 2-foot set back distance on both sides of a temporary barrier system used with traffic on both sides of the barrier. Install the temporary barrier system under the manufacturer's instructions.

12-3.20C(3)(c)–12-3.20C(3)(h)

Reserved

12-3.20C(4)–12-3.20C(9)

Reserved

12-3.20C(10) Temporary Terminal Sections

Reserved

12-3.20D Payment

The payment quantity for types of temporary barrier systems is the length measured along the top of the barrier segments.

10-18-19

12-3.21 TEMPORARY TRAFFIC SCREENS

12-3.21A General

Section 12-3.21 includes specifications for installing temporary traffic screens.

12-3.21B Materials

Temporary traffic screen panels must be one of the following:

1. CDX grade or better plywood
2. Weather-resistant strand board
3. Plastic

Plastic temporary traffic screen panels must be on the Authorized Material List for temporary traffic screen.

Wale boards for use with plywood or strand board must be Douglas fir, rough sawn, construction grade or better.

Pipe screen supports must be schedule 40, galvanized steel pipe.

Nuts, bolts, and washers must be cadmium plated.

Screws must be black or cadmium-plated flat head, cross-slotted, with full-thread length.

Temporary traffic screen panels must be CDX grade or better, plywood or weather-resistant strand board.

Wale boards must be Douglas fir, rough sawn, construction grade or better.

Pipe screen supports must be schedule 40, galvanized steel pipe.

Nuts, bolts, and washers must be cadmium plated.

Screws must be black or cadmium-plated flat head, cross-slotted screws with full-thread length.

12-3.21C Construction

Install and anchor temporary traffic screens to the top of the Type K temporary railing. The temporary traffic screen must have 3-foot-long openings spaced at 200-foot intervals.

A lateral move of Type K temporary railing with attached temporary traffic screen is change order work if ordered and repositioning is not shown.

12-3.21D Payment

The payment quantity for temporary traffic screen is the length measured along the line of the screen with no deductions for openings in the temporary traffic screen.

12-3.22 TEMPORARY CRASH CUSHION MODULES

12-3.22A General

Section 12-3.22 includes specifications for placing sand-filled temporary crash cushion modules in groupings or arrays.

If activities expose traffic to a fixed obstacle, protect the traffic from the obstacle with a sand-filled temporary crash cushion. The crash cushion must be in place before opening traffic lanes adjacent to the obstacle.

12-3.22B Materials

Each sand-filled temporary crash cushion module must be manufactured after March 31, 1997 and be on the Authorized Material List for highway safety features.

The color of each module must be standard yellow with black lids as furnished by the manufacturer. Each module must be free from structural flaws and objectionable surface defects.

For a module requiring a seal, the top edge of the seal must be securely fastened to the wall of the module by a continuous strip of heavy-duty tape.

Fill each module with sand under the manufacturer's instructions and to the sand capacity in pounds for each module shown. Sand for filling the modules must be clean, commercial-quality, washed concrete sand. When sand is placed in a module, the sand must contain no more than 7 percent water when tested under California Test 226.

12-3.22C Construction

Use the same type of crash cushion module for a single grouping or array.

Temporary crash cushion arrays must not encroach on the traveled way.

Secure the sand-filled modules in place before starting an activity requiring a temporary crash cushion.

Maintain sand-filled temporary crash cushions in place at each location, including times when work is not actively in progress. You may remove the crash cushions during the work shift for access to the work if the exposed fixed obstacle is 15 feet or more from the nearest lane carrying traffic. Reset the crash cushion before the end of the work shift.

Immediately repair sand-filled temporary crash cushion modules damaged due to your activities. Remove and replace any module damaged beyond repair. Repair and replacement of temporary crash cushion modules damaged by traffic are change order work.

You may place sand-filled temporary crash cushion modules on movable pallets or frames complying with the dimensions shown. The pallets or frames must provide a full-bearing base beneath the modules. Do

not move the modules and supporting pallets or frames by sliding or skidding along the pavement or bridge deck.

Attach a Type R or Type P marker panel to the front of the temporary crash cushion if the closest point of the crash cushion array is within 12 feet of the traveled way. Firmly fasten the marker panel to the crash cushion with commercial quality hardware or by other authorized methods. Attach the Type R marker panel such that the top of the panel is 1 inch below the module lid. Attach the Type P marker panel such that the bottom of the panel rests upon the pallet or roadway surface if pallets are not used.

A lateral move of a temporary crash cushion module is change order work if ordered and the repositioning is not shown.

Remove sand-filled temporary crash cushion modules, including sand, pallets or frames, and marker panels, at Contract acceptance. Do not install sand-filled temporary crash cushion modules in the permanent work.

12-3.22D Payment

The payment quantity for temporary crash cushion module does not include:

1. Modules placed for public safety
2. Modules placed in excess of the number described
3. Repositioned modules

04-16-21

12-3.23 IMPACT ATTENUATOR VEHICLES

12-3.23A General

12-3.23A(1) Summary

Section 12-3.23 includes specifications for using impact attenuator vehicles.

12-3.23A(2) Definitions

impact attenuator vehicle: Deployed impact attenuator mounted to a truck or deployed impact attenuator mounted to a trailer and towed by a truck.

12-3.23A(3) Submittals

Submit a certificate of compliance for each impact attenuator.

12-3.23A(4) Quality Assurance

Reserved

12-3.23B Materials

12-3.23B(1) General

Each impact attenuator vehicle includes:

1. Truck
2. Impact attenuator
3. Type II flashing arrow sign or PCMS
4. Flashing or rotating amber light
5. Two-way communication system

12-3.23B(2) Impact Attenuators

Each impact attenuator must:

1. Be on the Authorized Material List for highway safety features.
2. Comply with MASH test level 3 or NCHRP 350 test level 3 up to December 31, 2026, where the posted speed limit is 50 mph or more.
3. Comply with MASH test level 2 or 3 or NCHRP 350 test level 2 or 3 up to December 31, 2026, where the posted speed limit is 45 mph or less.
4. Be individually identified with the manufacturer's name, address, attenuator model number, and serial number. The name and number must be a minimum 1/2-inch high, located on the street side on the lower left front corner.

- Have an inverted V-chevron pattern placed across the entire rear of the attenuator and composed of alternating 4-inch-wide, nonreflective black stripes and 4-inch-wide, yellow retroreflective stripes sloping at 45 degrees.

12-3.23B(3) Trucks

Each truck must comply with:

- Veh Code Div 12
- Vehicle weight limits as shown in the Authorized Materials List for highway safety features and the impact attenuator manufacturer's instructions except the vehicle weight must be greater than 22,000 pounds when used with a stationary impact attenuator vehicle
- Impact attenuator manufacturer's mounting requirements

A PCMS used as a flashing arrow sign must comply with the specifications for an arrow board in the *California MUTCD*.

12-3.23C Construction

12-3.23C(1) General

Secure objects, including equipment, tools, and ballast, on impact attenuator vehicles to prevent their loosening upon impact by an errant vehicle.

Do not use a damaged attenuator. Replace any damaged attenuator.

Do not place an impact attenuator vehicle within the buffer space.

Position the front of the impact attenuator vehicle at a distance upstream from the moving work vehicle as shown in the following table:

Posted speed limit (mph)	Distance (feet)
<45	100
45–55	150
>55	175

Monitor the placement and use of the impact attenuator vehicle on a regular basis and adjust the position to match changing field conditions as construction progresses.

12-3.23C(2) Stationary Impact Attenuator Vehicles

Section 12-3.23C(2) applies if a bid item for stationary impact attenuator vehicles is shown on the Bid Item List.

Use a stationary impact attenuator vehicle to protect workers on foot within the work area when the posted speed limit is 55 mph or greater and workers are not protected by a longitudinal barrier system.

Place the stationary impact attenuator vehicle between the longitudinal buffer space and the work area without intruding into the buffer space. Position the front of the stationary impact attenuator vehicle at a distance upstream of the work area as shown in the following table:

Posted speed limit (mph)	Distance (feet)
<45	75
45–55	100
>55	150

Place the transmission in park and set the parking brake or follow the impact attenuator manufacturer's instructions.

12-3.23D Payment

Stationary impact attenuator vehicle will be measured by 1-day of operation counting as 1 measure unit. A day is defined as 24 consecutive hours beginning at the start of the work shift and includes relocation of the stationary impact attenuator.

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12-3.24–12-3.29 RESERVED

12-3.30 FLASHING ARROW SIGNS

12-3.30A General

Section 12-3.30 includes specifications for placing flashing arrow signs.

12-3.30B Materials

A flashing arrow sign must comply with the requirements shown in the following table:

Flashing Arrow Sign Requirements

Type	Panel size (min, inches)	Number of panel lights (min)	Legibility distance ^a (min, miles)
I	48 x 96	15	1
II	36 x 72	13	3/4

^aThe legibility distance is the distance that a flashing arrow sign must be legible at noon on a cloudless day and during the hours of darkness by persons with 20/20 vision or vision corrected to 20/20.

A flashing arrow sign must be finished with commercial-quality nonreflective black enamel and must be equipped with yellow or amber lamps that form arrows or arrowheads. Each lamp must be equipped with a visor and the lamps must be controlled by an electronic circuit that provides from 30 to 45 complete operating cycles per minute for each of the displays and modes specified. The control must be capable of dimming the lamps by reducing the voltage to 50 ± 5 percent for nighttime use. Type I signs must have both manual and automatic photoelectric-dimming controls. Dimming in both modes must be continuously variable over the entire dimming range.

A flashing arrow sign must be capable of operating in the following display modes:

1. Pass left display
2. Pass right display
3. Simultaneous display
4. Caution display or alternating diamond

A flashing arrow sign must be capable of operating in the flashing arrow mode or the sequential mode.

In the flashing arrow mode, all lamps forming the arrowhead and shaft must flash on and off simultaneously.

In the sequential mode, either arrowheads or arrows must flash sequentially in the direction indicated.

In the simultaneous display mode, the lamps forming both the right and left arrowheads and the lamps forming the arrow shaft or center 3 lamps for Type I signs must flash simultaneously. For Type II signs, the lamps forming the right and left arrowhead, but not the center lamp, may be illuminated continuously; the lamps forming the shaft and the center lamp of the arrowheads must flash on and off simultaneously.

In the caution display mode, a combination of lamps not resembling any other display or mode must flash.

Each flashing arrow sign must be:

1. Mounted on a truck or trailer
2. Capable of operating when the vehicle is moving
3. Capable of being placed and maintained in operation at locations described

A Type II flashing arrow sign must be controllable by the operator of the vehicle while the vehicle is in motion.

The bottom of the flashing arrow sign must be a minimum of 7 feet above the roadway when mounted.

The trailer for a flashing arrow sign must be equipped with (1) devices to level and plumb the sign and (2) a supply of electrical energy capable of operating the sign.

12-3.30C Construction

Not Used

12-3.30D Payment

Not Used

12-3.31 PORTABLE FLASHING BEACONS

12-3.31A General

Section 12-3.31 includes specifications for placing, maintaining, and removing portable flashing beacons.

12-3.31B Materials

Each portable flashing beacon must have:

1. Standard and base
2. Signal section
3. Flasher unit
4. Battery power source

The components must be assembled to form a complete, self-contained, portable flashing beacon that can be delivered to the job site and placed into immediate operation.

The portable flashing beacon must be weatherproof and operate a minimum of 150 hours between battery recharging and routine maintenance.

The signal section must be yellow and comply with section 86-1.02R(4)(a), except it must be rated for 25 W at 12 V.

The flash rate for the flashing unit must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD*.

The standard must be adjustable to allow variable mounting of the signal section from 6 to 10 feet, from the bottom of the base to the center of the lens, and be capable of being secured at the desired height. The standard must be securely attached to the base and have a length of multiconductor, neoprene-jacketed cable long enough for the full vertical height.

The base must be (1) large enough to accommodate at least two 12 V automotive-type storage batteries and (2) a shape and weight such that the beacon will not roll if struck by a vehicle or pushed over.

12-3.31C Construction

Remove portable flashing beacons from the traveled way at the end of each night's work. You may store the flashing beacon at selected central locations within the highway where designated by the Engineer.

Moving portable flashing beacons from location to location if ordered after initial placement is change order work.

10-16-20

12-3.31D Payment

The payment quantity for portable flashing beacons (ea) is the number of portable flashing beacon locations with each location counting as 1 measurement unit.

10-18-19

12-3.32 PORTABLE CHANGEABLE MESSAGE SIGNS

12-3.32A General

12-3.32A(1) Summary

Section 12-3.32A includes specifications for placing, maintaining, and removing portable changeable message signs.

12-3.32A(2) Definitions

Reserved

12-3.32A(3) Submittals

If requested, submit a certificate of compliance for each PCMS.

Submit your cell phone number before starting the first activity that requires a PCMS.

12-3.32A(4) Quality Assurance

Reserved

12-3.32B Materials

Each PCMS consists of a sign panel, a controller unit, a power supply, and a structural support system.

The PCMS must:

1. Be assembled to form a complete self-contained unit that can be delivered to the job site and placed into immediate operation.
2. Operate at an ambient air temperature from -4 to 158 degrees F.
3. Not be affected by mobile radio transmissions other than those required to control the PCMS.
4. Be capable of displaying a 3-line message with at least 7 characters per line.
5. Provide a complete alphanumeric selection.
6. Be internally or externally illuminated during the hours of darkness, when non-illuminated pixels are used.
7. Have a dimming control that automatically adjusts the character light intensity to provide optimum character visibility and legibility under all ambient lighting conditions. The dimming control must have a minimum 3 manual dimming modes of different intensities.

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A message with 18-inch high characters or 12-inch high characters must be visible from a distance of 1,500 feet and legible from a distance of at least 750 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20.

10-18-19

A message with 10-inch high characters must be legible from a distance of at least 650 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20.

The controller must:

1. Be an all solid-state unit.
2. Include at least 5 preprogrammed messages.
3. Have a user adjustable display rate.
4. Have a user adjustable flashing-off time.
5. Include a screen to review the messages before being displayed on the sign.
6. Include a keyboard message entry system. The keyboard must be equipped with a security lockout feature.
7. Have nonvolatile memory to store an infinite number of user created messages.
8. Be installed at a location that allows the user to perform all the functions from a single position.

12-3.32C Construction

Use a PCMS with characters:

1. At least 18 inches in height where the useable shoulder area is 15 feet wide or more
2. At least 12 inches in height where the useable shoulder area is less than 15 feet wide
3. At least 10 inches in height if the PCMS is:
 - 3.1. Mounted on a service patrol truck or incident response vehicle
 - 3.2. Used for traffic control where the posted speed limit is less than 40 mph

Place a PCMS as far from the traveled way as practicable where it is legible to approaching traffic without encroaching on the traveled way. Where the vertical roadway curvature restricts the sight distance of approaching traffic, place the sign on or before the crest of the curvature where it is most visible to the

approaching traffic. Where the horizontal roadway curvature restricts the sight distance of approaching traffic, place the sign at or before the curve where it is most visible to approaching traffic. Where practicable, place the sign behind guardrail or Type K temporary railing.

If multiple signs are needed, place each sign on the same side of the road at least 1,000 feet apart on freeways and expressways and at least 500 feet apart on other types of highways.

04-16-21

Operate the PCMS under the manufacturer's instructions. Activate the security lockout feature at all times.

10-18-19

When in operation, place the bottom of a PCMS at least 7 feet above the roadway in areas where pedestrians are anticipated and 5 feet above the roadway elsewhere. Place the top of the PCMS no more than 14.5 feet above the roadway.

If more than one PCMS is simultaneously visible to traffic, only one sign may display a sequential message at any time. Do not use dynamic message displays, such as animation, rapid flashing, dissolving, exploding, scrolling, horizontal movement, or vertical movement of messages. The message must be centered within each line of the display.

You may use an additional PCMS if more than 2 phases are needed to display a message.

Display only messages shown or ordered.

Repeat the entire message continuously in not more than 2 phases of at least 3 seconds per phase. The sum of the display times for both of the phases must be a maximum of 8 seconds. If more than 2 phases are needed to display a message, use an additional PCMS.

You must be available by cell phone during activities that require a sign. Be prepared to immediately change the displayed message if ordered. You may operate the sign with a 24-hour timer control or remote control if authorized.

Keep the PCMS clean to provide maximum visibility.

After the initial placement, move a sign from location to location as ordered.

12-3.32D Payment

Not Used

10-15-21

12-3.33 PORTABLE SIGNAL SYSTEMS

12-3.33A General

12-3.33A(1) Summary

Section 12-3.33 includes specifications for installing, maintaining, and removing portable signal systems.

A portable signal system includes:

1. Two or more signal units
2. Portable lighting
3. Portable flashing beacons

The components of a portable signal system are shown.

12-3.33A(2) Definitions

Not Used

12-3.33A(3) Submittals

Submit a certificate of compliance for each portable signal system.

Submit a 24-hour contact phone number before starting the activity that requires the portable signal system.

12-3.33A(4) Quality Assurance

Assign an on-site portable signal system coordinator. The coordinator must be available to service, maintain, and relocate system components as necessary. The coordinator must be accessible 24 hours a day while the system is in operation.

Replace or repair damaged or malfunctioning portable signal system units within 12 hours of notification of a system failure.

12-3.33B Materials

The portable signal system must:

1. Comply with Part 4 of the California MUTCD
2. Be a complete system that can be delivered to the job site and placed into immediate operation
3. Withstand a 90-mph wind speed under AASHTO (2001) Standard Specification for Highway Signs, Luminaries and Traffic Signals
4. Have a minimum one-mile communication range between signal units, not line of sight
5. Provide local and remote system control, monitoring, and diagnostics through a dedicated controller or computer
6. Prevent unauthorized users or electronic devices from gaining access to the portable signal system using an industry authentication and encryption standard level of security
7. Operate in either fixed time, traffic actuated, or manual mode
8. Operate at an ambient air temperature from -40 to 130 degrees F
9. Have secured wireless or wired communication between the signal units
10. Have a fail-safe device that monitors for malfunctions and prevents the system from displaying conflicting indications
11. Display a red/stop indication in all signal heads when a conflict or communication failure is detected
12. Continuously monitor and automatically send email or text alerts to designated personnel for:
 - 12.1. Signal malfunctions
 - 12.2. Conflicting indications
 - 12.3. Communication failures between signal units
 - 12.4. Power, voltage, and battery low levels
13. Use radar or video detection

A trailer must:

1. Be equipped with stabilizing and leveling devices
2. Be less than 7 feet wide

A signal unit consist of:

1. Two or more signal heads
2. Adjustable overhead mast arm
3. Adjustable shaft
4. Controller unit
5. Communication device
6. Redundant conflict monitoring device
7. Primary and back-up power sources

Signal units must:

1. Be self-contained and trailer mounted
2. Operate as a master or slave in a master-slave configuration
3. Automatically switch between the primary and the back-up power source in the event of a power failure

The signal heads must:

1. Comply with section 86-1.02R
2. Have 12-inch signal sections
3. Be arranged vertically
4. Be mounted one on the shaft and one on the mast arm

The adjustable mast arm must extend a minimum 8 feet separation between signal heads center to center.

The controller unit must:

1. Be an all solid-state unit
2. Have user adjustable timing parameters for each direction of travel, including bicycles and pedestrians
3. Include a 7-inch LCD color graphic touch screen to review the timing parameters
4. Include a keyboard timing entry system. The keyboard must be equipped with a security lockout feature
5. Have nonvolatile memory to store a library of user created traffic control scenarios

Wireless communication devices must be FCC approved Part 15 certified.

The primary power source must be either a generator or a photovoltaic system.

The back-up power source must be either a generator, a photovoltaic system, or battery reserve. The battery reserve must operate the signal unit for at least 10 days continuously without external power or recharge.

Portable lighting must:

1. Comply with 8 CA Regs § 1523
2. Be provided at every signal unit location
3. Be controlled using a photoelectric unit
4. Be part of the signal unit or on a separate trailer

12-3.33C Construction

Provide a portable signal system for reversible traffic control systems as shown.

Notify the Engineer at least 7 days prior to the use of the portable signal system. The traffic operations office from the district in which the work is located will provide the timing parameters.

Place the signal unit trailer as far from the traveled way as practicable where it is visible to approaching traffic without encroaching onto the traveled way.

Position signal heads and any attachments mounted on the mast arm over the road surface from 17 to 19 feet from the bottom of the signal head to the top of the road surface.

Position signal heads mounted on the trailer at a minimum height of 10 feet but not more than 19 feet from the bottom of the signal head to the top of the ground surface.

Operate the portable signal system under the manufacturer's instructions. Have a qualified vendor representative on site to perform the initial set up and enter the timing parameters.

Activate the security lockout feature at all times.

Program all signal units to display a flashing red indication upon startup.

Keep the portable signal system clean to provide maximum visibility.

If the portable signal system operation fails, provide flaggers to control traffic until the system is back in operation.

12-3.33D Payment

Not Used

04-15-22

12-3.34 TEMPORARY FLASHING BEACON SYSTEMS

12-3.34A General

Section 12-3.34 includes specifications for installing, maintaining, and removing temporary flashing beacon systems.

A temporary flashing beacon system must comply with section 87-20.

12-3.34B Materials

The sign panels installed on a temporary flashing beacon system must comply with section 12-3.11.

12-3.34C Construction

Not Used

12-3.34D Payment

Not Used

12-3.35 AUTOMATED WORK ZONE INFORMATION SYSTEMS

12-3.35A General

12-3.35A(1) Summary

Section 12-3.35 includes specifications for installing automated work zone information systems.

12-3.35A(2) Definitions

Reserved

12-3.35A(3) Submittals

Reserved

12-3.35A(4) Quality Assurance

Assign an on-site system coordinator. The coordinator must be available locally to service, maintain, and relocate system components as necessary. The coordinator must be accessible 24–7 while the system is deployed. If the system fails to perform as specified, perform any necessary remedial work and replace any failed components within 24 hours of notification of a system or component failure.

12-3.35B Materials

12-3.35B(1) General

The AWIS must be a proven system that has been successfully deployed and operated in actual work zones or congested areas.

The system must acquire traffic data throughout the work zone and automatically display predetermined information to motorists without operator intervention after system initialization.

Real-time information must be displayed to motorists using a PCMS. The sign must comply with section 12-3.32.

The system must be controlled either locally or remotely by a dedicated controller or computer.

Authorized users must be able to both locally and remotely override motorist information messages.

Traffic sensors must not require adjustments after the initial deployment.

12-3.35B(2) General System Function Requirements

The general system functions of the AWIS must be capable of:

1. Preventing any unauthorized users or systems from gaining access to the PCMSs through an industry authentication and encryption standard level of security.
2. Providing current operational status locally and remotely. Operational status must include current traffic data and messages, communications system, and power status.
3. Delivering notifications either by telephone, voice, or text messages to alert support staff of trouble conditions.

4. Generating trouble alerts for conditions such as (1) low roadside equipment power or voltage, (2) system communications failure, (3) low speed traffic detected, and (4) excessive delay detected.
5. Adjusting the thresholds of reduced speed and congestion-induced delay at which the system initiates a trouble alert.
6. Allowing programming of the hours during which the trouble condition alerting subsystem initiates notification to authorized users.
7. Measuring periodically and automatically the power levels of all equipment. Alert support staff, locally and remotely via a telephone message, in time to provide supplemental power before the system ceases to operate.
8. Displaying preprogrammed messages based on the time of day and day of week.

12-3.35B(3) Motorist Information Message Requirements

The AWIS must be capable of:

1. Displaying predetermined speed, delay, diversion, and closure messages to motorists when user-adjustable thresholds are exceeded.
2. Updating its speed and delay advisory messages at least once per minute. The actual message updates must be consistent with traffic conditions.
3. Selecting messages for each PCMS independently, based on the traffic conditions downstream of the sign.
4. Recording motorist information messages in a comma-separated values file with time and date stamps, including message overrides with user ID.
5. Displaying default messages when traffic conditions, system algorithms, and user parameters do not dictate that an advisory message should be displayed.
6. Displaying separate, independent, default messages on each PCMS.
7. Analyzing traffic parameters in work zones in which there are multiple speed limits.

The following parameters for the selection and presentation of information messages must be adjustable by the user:

1. Message update frequency
2. Minimum delay necessary to trigger a delay advisory message
3. Persistence of delay before a delay message is displayed
4. Level of delay required to trigger a diversion message
5. Change in delay needed to cause a delay advisory message update
6. Change in downstream speed at which a speed advisory message update occurs

12-3.35B(4) System Communication Requirements

The wireless communications subsystem of the AWIS must:

1. Operate independently of the public cellular phone system for receiving data to ensure reliable communications
2. Communicate independent of the line of sight or distance
3. Incorporate an error detection and correction mechanism to ensure the integrity of all traffic condition data and motorist information messages
4. Configure automatically during system initialization

12-3.35B(5) Traffic Data Acquisition Requirements

The AWIS must collect accurate traffic data using a speed measurement technique with an accuracy of ± 5 mph, allowing specific information messages. The system must collect data during reduced visibility conditions, including precipitation, fog, darkness, excessive dust, and road debris.

The system must (1) archive the data with time and date stamps and (2) aggregate the data in operator-definable time increments, accessible 24–7 to the Engineer in a comma-separated values file.

12-3.35B(6) User Interface

The system must have a user interface to control the AWIS PCMS communications. The interface must be (1) software compatible with a Windows environment or (2) a web service accessed by a web browser.

Provide any software on a CD or other Engineer-authorized data-storage device for installation at the Department's Transportation Management Center.

The user interface must, at a minimum, provide the user with a list of AWIS PCMSs in the field, location information for each AWIS PCMS, and a real-time on-board display of the message in the field. Control options must, at a minimum, provide the user the ability to change the on-board messages and flash rate.

12-3.35C Construction

Obtain authorization for the message content and the threshold used for triggering the message before displaying any message on a PCMS.

Provide complete setup and support for the AWIS PCMS communications.

12-3.35D Payment

Not Used

12-3.36 PORTABLE TRANSVERSE RUMBLE STRIPS

Reserved

10-16-20

12-3.37 PORTABLE RADAR SPEED FEEDBACK SIGN SYSTEMS

12-3.37A General

Section 12-3.37 includes specifications for placing, maintaining, and removing portable radar speed feedback sign systems.

12-3.37B Materials

A portable radar speed feedback sign system must comply with the requirements for a temporary radar speed feedback sign system, except it must be trailer mounted.

12-3.37C Construction

Not Used

12-3.37D Payment

Not Used

10-18-19

12-3.38 AUTOMATED FLAGGER ASSISTANCE DEVICES

12-3.38A General

12-3.38A(1) Summary

Section 12-3.38 includes specifications for placing, maintaining, and removing automated flagger assistance devices (AFADs).

12-3.38A(2) Definitions

automated flagger assistance devices: Devices that enable a flagger to be positioned out of the lane of traffic and are used to control motorists through work zones. They are designed to be remotely operated either by a single flagger at one end of the work zone or at a central location, or by separate flaggers near the devices.

12-3.38A(3) Submittals

Submit a copy of the manufacturer's operating instructions for the automated flagger assistance devices.

12-3.38A(4) Quality Assurance

Reserved

12-3.38B Materials

04-17-20

The automated flagger assistance device must comply with the *California MUTCD*, Section 6E.04, and Section 6E.06, "Red/Yellow Lens Automated Flagger Assistance Devices."

The device must:

1. Be equipped with a gate arm, which must not extend into the opposing lane
2. Alternately display a steadily illuminated circular red lens and a flashing circular yellow lens to control traffic
3. Have a fail-safe device that prevents the operator from inadvertently actuating a simultaneous flashing circular yellow lens at both ends of the work zone
4. Have a device that monitors for malfunctions and prevents the display of conflicting indication
5. Have a 24-by-30-inch R10-6 STOP HERE ON RED sign mounted on the trailer

The device must continuously monitor the wireless communication links and verify transmission and reception of data between the devices. If communication is lost, the devices must immediately display the circular red/stop indication and lower the gate arms.

12-3.38C Construction

The devices must:

1. Be placed where a flagger station is shown with an unobstructed view from the operator
2. Be placed outside of the traveled lane
3. Be attended by the operator when in use
4. Have a minimum of 9 cones placed on a taper in advance of the device and along the edge of shoulder or edge of the traveled way at 25-foot intervals to a point not less than 25 feet past the device
5. Be clearly visible to approaching traffic and illuminated during the hours of darkness

If any device unit becomes inoperative, do one of the following:

1. Replace the unit with the same type and model.
2. Revert to human flagging operations.
3. Terminate all construction activities requiring the use of the devices.

Incorporate the devices into the traffic control using one of the following methods:

1. Method 1: Place one device at each end of the closure.
2. Method 2: Place one device at one end of the closure and a flagger at the opposite end of the closure.

Use two operators for both methods, except you may use a single operator if:

1. Operator has an unobstructed view of the devices
2. Operator has an unobstructed view of approaching traffic in both directions
3. Second flagger is on-site to assist with manual flagging should the device malfunction, or to direct traffic when drivers fail to comply with the devices

When AFADs are in operation:

1. Use portable transverse rumble strips at your discretion
2. Do not use the 48-inch-by-48-inch C9A (CA) sign
3. Do not use the gate cones

12-3.38D Payment

If automated flagger assistance devices bid item is not shown on the Bid Item List, providing AFADS is change order work.

12-3.39 TEMPORARY RADAR SPEED FEEDBACK SIGN SYSTEMS

12-3.39A General

Section 12-3.39 includes specifications for placing, maintaining, and removing temporary radar speed feedback sign systems.

12-3.39B Materials

A temporary radar speed feedback sign system must comply with the requirements under section 87-20.

12-3.39C Construction

Place the system:

1. As far from the traveled way as practicable where it is visible and legible to approaching traffic. Where practicable, place the sign behind a barrier or guardrail.
2. At or before the crest of roadway vertical curvatures that restrict sight distance.
3. At or before the curve of horizontal roadway curvatures that restrict sight distance.

Install a G20-5aP WORK ZONE plaque.

12-3.39D Payment

Not Used

04-16-21

12-3.40 VARIABLE SPEED LIMIT SIGN SYSTEM

12-3.40A General

12-3.40A(1) Summary

Section 12-3.40 includes specifications for placing, maintaining, and removing variable speed limit sign systems.

12-3.40A(2) Definitions

Not Used

12-3.40A(3) Submittals

Submit as an informational submittal a weekly variable speed limit sign system log report by Tuesday of the following week.

12-3.40A(4) Quality Assurance

Not Used

12-3.40B Materials

12-3.40B(1) General

A variable speed limit sign system consists of:

1. Signs
2. Two flashing beacons
3. Power source

The variable speed limit sign system must:

1. Display the speed limit characters without animation.
2. Automatically adjust the digital display intensity to provide optimum character visibility and legibility under all ambient lighting conditions using a photocell.
3. Create and maintain an electronic log report of the local and remote activities and system failures. The report must include:
 - 3.1. Date and time.
 - 3.2. Location description, county, route, direction, post mile or station, and GPS position.
 - 3.3. Speeds shown on the digital display.
 - 3.4. ON or OFF status of flashing beacons.
 - 3.5. System failure description including:
 - 3.5.1. Cause of failure.
 - 3.5.2. List of equipment that failed.
 - 3.5.3. Work performed to correct the failure.
 - 3.5.4. Duration of failure.
 - 3.6. Name and unique user ID for user operating or repairing the system.
4. Include local and remote control of digital display legend and flashing beacons.

5. Have a scheduling feature to allow for local or remote pre-programming of the digital display legend and flashing beacons at specific times and dates.
6. Send a real-time text or email message to the designated personnel for the following types of alerts:
 - 6.1. Equipment alerts including low power, loss of power, and loss of communication.
 - 6.2. Traffic alerts including flashing beacons ON or Off activations and digital display legend changes.

Signs must comply with section 82-2.

The variable speed limit sign includes a digital display as part of the R2-1 sign. The R2-1 sign must be:

1. 48 by 60 inches for freeways and expressways
2. 36 by 48 inches for conventional highways

The variable speed limit sign systems must include a G20-5aP sign above the R2-1 sign. The G20-5aP sign must have characters:

1. 8 inches in height for freeways and expressways
2. 6 inches in height for conventional highways

The digital display must:

1. Be LED white legend on a black background.
2. Have two numerical characters. Each character must be:
 - 2.1. Based on a minimum 5 x 7 character ratio.
 - 2.2. At least 18 inches in height for freeways and expressways.
 - 2.3. At least 14 inches in height for conventional highways.
3. Have a minimum 30 degrees cone of visibility, ± 15 degrees from the centerline.

The flashing beacons must:

1. Be yellow and comply with section 86-1.02R(4), except they may be rated for 12 V.
2. Operate in the alternating flashing mode. The flash rate for the flashing unit must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD*.
3. Be securely mounted to assembly.
4. Be positioned vertically, one at a distance no more than 12 inches above the edge of the top sign and one at a distance no more than 12 inches below the edge of the bottom sign.

The power source must be either a generator or photovoltaic system and must include batteries to maintain the system's communication and operation for 10 continuous days without external power or recharge.

12-3.40B(2) Portable Variable Speed Limit Sign Systems

A portable variable speed limit sign system must be trailer mounted.

12-3.40B(3) Temporary Variable Speed Limit Sign Systems

A temporary variable speed limit sign system must be post mounted under section 82-3.

12-3.40C Construction

Place the variable speed limit sign system:

1. As far from the traveled way as practicable where it is visible and legible to approaching traffic. Where practicable, place the sign behind a barrier or guardrail.
2. At or before the crest of roadway vertical curvatures that restrict sight distance.
3. At or before the curve of horizontal roadway curvatures that restrict sight distance.
4. With the bottom of the R2-1 sign a minimum of 7 feet above the roadway.

Delineate trailers with a taper consisting of 9 traffic cones placed 25 feet apart except when placed behind a barrier. Set up and level the portable system.

Activate the flashing beacons and set the digital display to the reduced speed limit only when workers are present within the construction work zone and no more than 15 minutes before workers arrive in the work zone. Do not display unauthorized speed limits.

Deactivate the flashing beacons and change the digital display to the original posted speed limit no later than 15 minutes after workers depart the work zone.

12-3.40D Payment

Not Used

10-18-19

12-4 MAINTAINING TRAFFIC

12-4.01 GENERAL

12-4.01A General

Section 12-4.01 includes general specifications for maintaining traffic through construction work zones.

If local authorities regulate traffic, notify them at least 5 business days before the start of job site activities. Cooperate with the local authorities to handle traffic through the work zone and to make arrangements to keep the work zone clear of parked vehicles.

12-4.01B Materials

Not Used

12-4.01C Construction

Not Used

12-4.01D Payment

Not Used

12-4.02 TRAFFIC CONTROL SYSTEMS

12-4.02A General

12-4.02A(1) Summary

Section 12-4.02 includes specifications for providing a traffic control system to close traffic lanes, shoulders, ramps, and connectors.

A traffic control system for a closure includes flagging and the temporary traffic control devices described as part of the traffic control system. Temporary traffic control devices must comply with section 12-3.

12-4.02A(2) Definitions

Construction Zone Enhanced Enforcement Program (COZEEP): Program that provides California Highway Patrol officers to monitor the movement of traffic within the work zone.

10-16-20

Buffer lane: Closed lane that separates a lane carrying traffic from the work area to enhance safety of workers and allow errant vehicles to recover safely.

10-18-19

designated holidays: Designated holidays are shown in the following table:

Designated Holidays

Holiday	Date observed
New Year's Day	January 1st
Washington's Birthday	3rd Monday in February
Memorial Day	Last Monday in May
Independence Day	July 4th
Labor Day	1st Monday in September
Veterans Day	November 11th
Thanksgiving Day	4th Thursday in November
Christmas Day	December 25th

If a designated holiday falls on a Sunday, the following Monday is a designated holiday. If November 11th falls on a Saturday, the preceding Friday is a designated holiday.

12-4.02A(3) Submittals

12-4.02A(3)(a) General

Submit a request for a minor deviation from the specified work hours. For a project in District 7, submit the request at least 15 days before the proposed closure date. Your request may be authorized if (1) the Department does not accrue a significant cost increase and (2) the work can be expedited and better serve the traffic.

If a closure is not opened to traffic by the specified time, submit a work plan that ensures that future closures will be opened to traffic by the specified time. Allow 2 business days for review.

Submit closure schedule requests and closure schedule amendments using LCS to show the locations and times of the requested closures.

Submit a traffic break request using LCS to show the location and time of the requested traffic break.

12-4.02A(3)(b) Closure Schedules

Every Monday by noon, submit a closure schedule request for planned closures for the next week.

Except for a project in District 7, the next week is defined as Sunday at noon through the following Sunday at noon.

For a project in District 7, the next week is defined as Friday at noon through the following Friday at noon.

Submit a closure schedule request from 25 days to 125 days before the anticipated start of any job site activity that reduces:

1. Horizontal clearances of traveled ways, including shoulders, to 2 lanes or fewer due to activities such as temporary barrier placement and paving
2. Vertical clearances of traveled ways, including shoulders, due to activities such as pavement overlays, overhead sign installation, or falsework girder erection

Submit closure schedule changes, including additional closures, by noon at least 3 business days before a planned closure.

Cancel closure requests using LCS at least 48 hours before the start time of the closure.

The Department notifies you through LCS of authorized and unauthorized closures and closures that require coordination with other parties as a condition for authorization.

12-4.02A(3)(c) Contingency Plans for Closures

Submit a contingency plan for an activity that could affect a closure if a contingency plan is specified in the special provisions or if a contingency plan is requested.

If a contingency plan is requested, submit the contingency plan within 1 business day of the request.

The contingency plan must identify the activities, equipment, processes, and materials that may cause a delay in the opening of a closure to traffic. The plan must include:

1. List of additional or alternate equipment, materials, or workers necessary to ensure continuing activities and on-time opening of closures if a problem occurs. If the additional or alternate equipment, materials, or workers are not on the job site, specify their location, the method for mobilizing these items, and the required time to complete mobilization.
2. General time-scaled logic diagram displaying the major activities and sequence of the planned activities. For each activity, identify the critical event that will activate the contingency plan.

Submit revisions to a contingency plan at least 3 business days before starting the activity requiring the contingency plan. Allow 2 business days for review.

12-4.02A(3)(d) Traffic Break Schedule

Every Monday by noon, submit a traffic break request for the next week. Support for a traffic break is based on local California Highway Patrol staffing levels and may not be available for the date or time requested.

Traffic break requests are limited to the hours when a shoulder or lane closure is allowed.

Cancel a traffic break request using LCS at least 48 hours before the start time of the traffic break.

The Department notifies you through LCS of authorized and unauthorized traffic breaks.

The Department does not adjust time or payment if (1) a California Highway Patrol officer is unavailable for the requested date or time or (2) your request is not authorized.

12-4.02A(4) Quality Assurance

Reserved

12-4.02B Materials

Not Used

12-4.02C Construction

12-4.02C(1) General

Work that interferes with traffic is limited to the hours when closures are allowed.

Do not reduce an open traffic lane width to less than 10 feet. If traffic cones or delineators are used for temporary edge delineation, the side of the base of the cones or delineators nearest to traffic is considered the edge of the traveled way.

Do not simultaneously close consecutive ramps in the same direction of travel servicing 2 consecutive local streets unless authorized.

Notify the Engineer of delays in your activities caused by the denial of either (1) an authorized closure or (2) a closure schedule request for the specified time frame allowed for closures.

Discuss the contingency plan for any activity that could affect the closure schedule with the Engineer at least 5 business days before starting the activity requiring the plan.

If you do not open a closure to traffic by the specified time, suspend work and submit a work plan. No further closures are allowed until your work plan has been authorized.

If the Engineer orders you to remove a closure before the time designated in the authorized closure schedule, any delay caused by this order is an excusable delay.

The Engineer may reschedule a closure that was canceled due to unsuitable weather.

You may use automated flagger assistance devices to enhance the traffic control system for a lane closure on a two-lane convention highway, except if a bid item for automated flagger assistance devices is shown in the Bid Item List, the use of AFADs is required.

Do not use automated flagger assistance devices:

1. On multi-lane highways
2. As a substitute or a replacement for a temporary traffic control signal
3. If the devices impair access for pedestrians and bicycles, unless alternate access is provided
4. If the usable shoulder area is not wide enough to place a trailer mounted device
5. If the distance between the devices is more than 800 feet, except when each device is controlled by a separate operator and radio communication is available between the AFAD operators

12-4.02C(2) Lane Closure System

12-4.02C(2)(a) General

The Department provides LCS training. Request the LCS training at least 30 days before submitting the 1st closure request. The Department provides the training within 15 days after your request.

LCS training is web-based or held at a time and location agreed upon by you and the Engineer. For web-based training, the Engineer provides you the website address to access the training.

Within 5 business days after completion of the training, the Department provides LCS accounts and user IDs to your assigned, trained representatives.

Each representative must maintain a unique password and current user information in the LCS.

The project is not accessible in LCS after Contract acceptance.

12-4.02C(2)(b) Status Updates for Authorized Closures

Update the status of authorized closures using the LCS Mobile web page.

For a stationary closure on a traffic lane, use code:

1. 10-97 immediately before you place the 1st cone on the traffic lane
2. 10-98 immediately after you remove all of the cones from the traffic lane

For a stationary closure on the shoulder, use code:

1. 10-97 immediately before you place the 1st cone after the last advance warning sign
2. 10-98 immediately after you remove the last cone before the advance warning signs

For a moving closure, use code:

1. 10-97 immediately before the actual start time of the closure
2. 10-98 immediately after the actual end time of the closure

For closures not needed on the authorized date, use code 10-22 within 2 hours after the authorized start time.

If you are unable to access the LCS Mobile web page, immediately notify the Engineer of the closure's status.

12-4.02C(3) Closure Requirements and Charts

12-4.02C(3)(a) General

10-16-20

Where two or more lanes in the same direction of travel and on the same side are adjacent to the work area, closures must comply with the buffer lane requirements.

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12-4.02C(3)(b) Complete Freeway or Expressway Closure Requirements

Reserved

12-4.02C(3)(c) HOV, Express, and Bus Lane Closure Requirements

Reserved

12-4.02C(3)(d) City Street Closure Requirements

Reserved

12-4.02C(3)(e) Closure Restrictions for Special Events and Venues

Reserved

12-4.02C(3)(f) Closure Restrictions for Designated Holidays and Special Days

Reserved

12-4.02C(3)(g) Freeway or Expressway Lane Requirement Charts

Reserved

12-4.02C(3)(h) Complete Freeway or Expressway Closure Hour Charts

Reserved

12-4.02C(3)(i) Complete Connector Closure Hour Charts and Connector Lane Requirement Charts

Reserved

12-4.02C(3)(j) Complete Ramp Closure Hour Charts and Ramp Lane Requirement Charts

Reserved

12-4.02C(3)(k) Conventional Highway Lane Requirement Charts

Reserved

12-4.02C(3)(l) Complete Conventional Highway Closure Hour Charts

Reserved

12-4.02C(3)(m) City Street Closure Hour Charts and City Street Lane Requirement Charts

Reserved

12-4.02C(3)(n) Concrete Slab and Approach Slab Replacement Closure Hours Table

Reserved

12-4.02C(3)(o)–12-4.02C(3)(s) Reserved

10-16-20

12-4.02C(4) Buffer Lanes

Where two or more lanes are adjacent to a work area, including work on shoulders, you must close the lane adjacent to the work area in accordance with the lane requirement charts as follows:

1. Work is on the traveled way within 6 feet of the adjacent traffic lane.
2. Work is off the traveled way but within 6 feet of the edge of the traveled way, and the posted speed is 45 mph or greater.
3. Work is off the traveled way but within 3 feet of the edge of the traveled way, and the posted speed is less than 45 mph.

Closure of the adjacent traffic lane is not required for:

1. Workers protected by a permanent or temporary barrier
2. Installation, maintenance, or removal of traffic control devices except for temporary railing

For time periods at the beginning or end of work when the lane requirement charts do not allow the closure of the adjacent traffic lane, the following construction activities are allowed without a buffer lane:

1. Paving.
2. Parking, positioning, loading, unloading vehicles, or storing equipment or materials necessary for the work being performed.
3. Placing, removing or maintaining traffic stripes, pavement marking, or pavement markers.
4. Operations not performed by workers on foot such as grinding, grooving, planing, sweeping, applying a tack coat, or operating a crane.
5. Operations where workers on foot are protected, at each work location, within the same closure by an impact attenuator vehicle in the lane adjacent to live traffic.

Do not perform work activities or store equipment, vehicles, or materials within the buffer lane.

10-18-19

12-4.02C(5)–12.4.02C(6) Reserved

12-4.02C(7) Traffic Control System Requirements

12-4.02C(7)(a) General

Control traffic using stationary closures.

If components of the traffic control system are displaced or cease to operate or function as specified, immediately repair them to their original condition or replace them and place them back in their original locations.

04-16-21

Do not start activities that require an impact attenuator vehicle until the attenuator is in place.

10-18-19

Each vehicle used to place, maintain, and remove components of a traffic control system on a multilane highway must have a Type II flashing arrow sign that must operate whenever the vehicle is used for placing, maintaining, or removing the components. For a stationary closure, vehicles with a Type II flashing arrow sign not involved in placing, maintaining, or removing the components must display only the caution display mode. If a flashing arrow sign is required for a closure, activate the sign before the closure is in place.

12-4.02C(7)(b) Stationary Closures

Except for channelizing devices placed along open trenches or excavations adjacent to the traveled way, remove the components of the traffic control system for a stationary closure from the traveled way and shoulders at the end of each work period. You may store the components at authorized locations within the limits of the highway.

If a traffic lane is closed with channelizing devices for excavation work, move the devices to the adjacent edge of the traveled way when not excavating. Space the devices as shown for the lane closure.

04-16-21

Use an impact attenuator vehicle to place and remove components of a stationary traffic control system. Do not use an impact attenuator vehicle on two-lane conventional highways if the vehicle would have to stop within a lane open to traffic to place, maintain, or remove the traffic control system.

04-16-21

12-4.02C(7)(c) Moving Closures

For a moving closure, use a PCMS truck mounted on the upstream sign vehicle. The full operational height to the bottom of the sign may be less than 7 feet above the ground but must be as high as practicable.

If you use a flashing arrow sign in a moving closure, the sign must be truck mounted on the upstream sign vehicle. Operate the flashing arrow sign in the caution display mode if it is being used on a 2-lane highway.

Use an impact attenuator vehicle as a shadow vehicle.

10-18-19

12-4.02C(7)(d) Traffic Breaks

You may request a traffic break for special operations such as:

1. Installation, removal, or replacement of an overhead power line or other utility cable across the highway
2. Installation or removal of traffic control devices in areas without a standard-width shoulder
3. Transportation of large equipment across the highway
4. Access to median areas for workers or equipment

If the Department authorizes the traffic break, the Engineer notifies you and arranges the traffic break with the California Highway Patrol through COZEEP. The duration of a traffic break must not exceed 5 minutes or as authorized.

Two California Highway Patrol officers per vehicle are required for traffic breaks occurring any time from 2200 to 0600 hours.

A minimum of 2 California Highway Patrol vehicles will be assigned to conduct a traffic break.

04-16-21

Place a truck mounted PCMS approximately 2,000 feet upstream of the work area or as agreed upon by the Engineer. Monitor the traffic during the traffic break. If a queue develops, reposition the PCMS truck far enough upstream of the traffic break to provide real-time notification to motorists before they approach the traffic queue.

12-4.02C(8) Traffic Control System Signs**12-4.02C(8)(a) General**

Traffic control system signs must comply with section 12-3.11.

12-4.02C(8)(b) Connector and Ramp Closure Signs

Inform motorists of a temporary closing of a (1) connector or a (2) freeway or expressway entrance or exit ramp using:

1. SC6-3(CA) (Ramp Closed) sign for closures of 1 day or less
2. SC6-4(CA) (Ramp Closed) sign for closures of more than 1 day

SC6-3(CA) and SC6-4(CA) signs must be stationary mounted at the locations shown and must remain in place and visible to motorists during the connector or ramp closure.

Notify the Engineer at least 2 business days before installing the sign and install the sign from 7 to 15 days before the closure.

12-4.02C(9) Flagging**12-4.02C(9)(a) General****12-4.02C(9)(a)(i) Summary**

Section 12-4.02C(9) includes specifications for flaggers, AFAD operators, additional flaggers, advance flaggers and flagger stations.

12-4.02C(9)(a)(ii) Definitions

AFAD operator: Flagger certified by the manufacturer to operate the specific automated flagger assistance device.

04-17-20

additional flagger: Flagger that controls the flow of traffic at intermediate locations within the limits of a closure with reversible control, at intersections, driveways and other traffic merging points.

10-18-19

advance flagger: Flagger positioned upstream of the traffic control system, who warns approaching traffic of road work ahead and potentially stopped traffic within the advance warning signs.

incidental flagger: Flagger that performs flagging that is not part of a traffic control system.

04-17-20

12-4.02C(9)(a)(iii) Submittals

Submit as informational submittals:

1. Flagger certification for each flagger including AFAD operators. The submittal must include:
 - 1.1. Name of the individual receiving certification.
 - 1.2. Name of entity providing certification.
 - 1.3. Date of certification.
 - 1.4. Certification expiration date.
2. AFAD manufacturer certification for each AFAD operator. The submittal must include:
 - 2.1. Name of the manufacturer's authorized trainer.
 - 2.2. Name of the trainee.
 - 2.3. Description of device type and model for which training was provided.
 - 2.4. Date when the training was provided.
3. Training qualifications for each incidental flagger.

12-4.02C(9)(a)(iv) Quality Assurance

Flaggers must be at least 18 years of age and maintain a valid government issued identification and must possess proof of certification during flagging operations.

10-15-21

Flaggers that are part of a traffic control system must be certified by an authorized flagger training provider. The authorized flagger training provider list is available at the Department's Division of Construction website.

04-17-20

In addition, AFAD operators must be certified by the AFAD manufacturer on:

1. Device type and model to be used on the project
2. Installation procedures
3. Local and remote-controlled operation
4. Maintenance of the device

Incidental flaggers must be trained under 8 CA Code of Regs § 1599.

10-18-19

12-4.02C(9)(b) Materials

Not Used

12-4.02C(9)(c) Construction

12-4.02C(9)(c)(i) General

Not Used

12-4.02C(9)(c)(ii) Flaggers

12-4.02C(9)(c)(ii)(A) General

Flaggers should stand in a conspicuous place and be visible to approaching vehicles.

10-16-20

Flaggers must wear a hard hat, safety glasses, and Class 3, high-visibility, safety apparel under ANSI/ISEA 107-2004, or equivalent subsequent revisions.

04-17-20

Flaggers must be equipped with a 24-by-24-inch "STOP/SLOW" paddle with a rigid staff tall enough to maintain the bottom of the paddle a minimum of 6 feet above the pavement.

10-18-19

12-4.02C(9)(c)(ii)(B) Automated Flagger Assistance Device Operators

When AFADs are in operation, the AFAD operators must:

1. Be positioned away from the traveled way
2. Be positioned where they have an unobstructed line of sight to approaching vehicles and to the devices
3. Keep a backup hand held AFAD remote control readily available

A pilot car driver must not operate a device and must not be considered as one of the flaggers present on-site available to operate a device.

10-16-20

12-4.02C(9)(c)(ii)(C) Additional Flaggers

Provide additional flaggers at any of the following locations:

1. At high-volume intersections and driveways between the two flagger stations as described
2. At Multi-lane and circular intersections

04-16-21

For other intersections and driveways, place a sign as described.

10-16-20

Additional flaggers use the STOP/SLOW sign paddle to control vehicles merging into the closure with reversible control.

If additional flaggers are not described, providing additional flaggers is change order work.

12-4.02C(9)(c)(ii)(D) Advance Flaggers

Provide advance flaggers when any of the following conditions exist:

1. Queued traffic reaches the W20-4 (One Lane Road Ahead) sign.
2. When the horizontal roadway curvature restricts the sight distance of approaching traffic.
3. When the vertical roadway curvature restricts the sight distance of approaching traffic.

Advance flaggers use the SLOW sign paddle to warn approaching vehicles of the flagging operation ahead and signals the drivers to slow down. If the STOP/SLOW paddle is used, the STOP side must be covered.

10-16-20

If advance flaggers are not described, providing advance flaggers is change order work.

10-18-19

12-4.02C(9)(c)(iii) Flagger Stations

Place flagger stations such that approaching vehicles have sufficient distance to react and follow the flagger's instructions.

Place a minimum of four cones at 50 foot intervals in advance of flagger stations.

During the hours of darkness, illuminate flagger stations under 8 CA Regs § 1523. Do not start flagging until flagger stations are illuminated.

Place advance warning signs W20-1, C9A(CA), and W3-4 upstream of the additional flagger station at intersections as shown.

Place advance warning signs W20-1, C9A(CA), and W3-4 upstream of the advance flagger station.

10-16-20

Remove the W20-1 sign from all flagger stations downstream from the advance flagger station furthest from the work area.

10-15-21

You may use a full-matrix PCMS in place of an advance flagger. The PCMS must alternately display the message "Prepare to Stop" and the C9A(CA) sign graphic. Place a portable W20-1 sign in advance of the PCMS.

04-16-21

If the distance *E* shown is 1,000 feet or more, place a SW60(CA) as shown. Place an additional SW60(CA) sign for every additional 1,000 feet of separation, space the signs at 1,000-foot intervals.

10-18-19

12-4.02C(9)(d) Payment

Not Used

10-16-20

12-4.02C(10) End of Queue Monitoring and Warning with Truck Mounted Changeable Message Sign

Reserved

12-4.02C(11) Traffic Control Technician**12-4.02C(11)(a) General****12-4.02C(11)(a)(i) Summary**

Section 12-4.02C(11) includes specifications for training, certification, and responsibilities for traffic control technicians.

The traffic control technician:

1. Is responsible for the installation, maintenance, and removal of traffic control devices
2. Must have the authority to assign and direct flagging operations

3. Must be knowledgeable about:
 - 3.1. Section 7-1.03 "Public Convenience"
 - 3.2. Section 7-1.04 "Public Safety"
 - 3.3. Section 12 "Temporary Traffic Control"
 - 3.4. Traffic control system Standard Plans
 - 3.5. Traffic handling plans and detour plans

10-15-21

Assign a traffic control technician to each closure.

10-16-20

12-4.02C(11)(a)(ii) Definitions

Reserved

12-4.02C(11)(a)(iii) Submittals

12-4.02C(11)(a)(iii)(A) General

Every Monday by noon, submit traffic control daily reports for the previous week as an informational submittal.

12-4.02C(11)(a)(iii)(B) Quality Assurance Submittals

Submit the following as informational submittals:

1. Traffic control technician certification and flagger certification for each traffic control technician and each alternate traffic control technician. The certification must include:
 - 1.1. Name of the individual receiving certification
 - 1.2. Name of entity providing certification
 - 1.3. Date of certification
 - 1.4. Certification expiration date
2. Contact information for each traffic control technician and each alternate traffic control technician. The submittal must include the name, phone number and email address.
3. Traffic control daily reports for each closure. The traffic control daily report must include:
 - 3.1. Date
 - 3.2. Name of traffic control technician
 - 3.3. Location of traffic control. Provide description, County, Route, Postmile or Station and Direction
 - 3.4. Reference to traffic control standard plan or project plan sheet
 - 3.5. For closure information include:
 - 3.5.1. Lane requirement chart number, start time, and end time
 - 3.5.2. Facility type: conventional highway, freeway, expressway, on ramp, off ramp, or connector, street
 - 3.5.3. Number of lanes closed, which lanes are closed, or shoulder closure
 - 3.5.4. Names of flaggers, if applicable
 - 3.5.5. Use of construction work zone speed limit reduction, buffer lanes, or COZEED support, if applicable
 - 3.6. Documentation of:
 - 3.6.1. LCS Mobile web page status confirmation for 1097 and 1098, or 1022
 - 3.6.2. Verification that closure is in compliance with the contract requirements
 - 3.6.3. Modifications to the traffic control including, a description of the change, the reason for the change, time when the change is implemented
 - 3.6.4. Traffic control system monitoring including, time of inspection and observations
 - 3.6.5. Incidents that occur while the traffic control system is in place

12-4.02C(11)(a)(iv) Quality Assurance

12-4.02C(11)(a)(iv)(A) General

The traffic control technician must coordinate with the Engineer the implementation of traffic control systems and traffic handling plans prior to construction, and before major changes in traffic control.

12-4.02C(11)(a)(iv)(B) Training and Certifications

A traffic control technician must be certified as a flagger and as a traffic control technician. Department authorized traffic control technician and flaggers training providers list is available at:

12-4.02C(11)(a)(iv)(C) Quality Control

The traffic control technician must:

1. Ensure safe, convenient, and effective passage of motorists, bicyclists, pedestrians, workers, and first responders, through or around the construction work zone
2. Inspect the condition of traffic control devices on a regular basis for compliance with the quality requirements in the American Traffic Safety Services Association publication *Quality Guidelines for Temporary Traffic Control Devices and Features*
3. Ensure the labor, equipment, and materials are available to immediately correct deficiencies in the traffic control system
4. Ensure workers performing flagging operations meet the flagger's certificate requirements
5. Ensure the status of closures is reported using the LCS Mobile web page
6. Verify that all closures comply with the contract requirements and that traffic control devices, including PCMS, arrow boards and radar speed feedback signs, are functioning after traffic control installation

12-4.02C(11)(b) Material

Not Used

12-4.02C(11)(c) Construction

For each closure, a traffic control technician must be present during the installation, operation, and removal of the traffic control system.

10-15-21

Notify the Engineer of the assigned traffic control technician for each closure 1 business day before the closure.

10-16-20

Notify the Engineer before an alternate traffic control technician assumes the duties of the assigned traffic control technician.

Traffic control technicians must be available by:

1. Cellular telephone
2. Two-way radio
3. Mobile internet access

Traffic control technician must:

1. Mark the locations for traffic control devices before installation of closures
2. Monitor work zone traffic control activities and operations, including detours, to ensure the traffic control is functioning properly

When monitoring work zone traffic control, if an imminent danger is identified, take immediate corrective action and notify the Engineer. Notify the Engineer of modifications needed to the traffic control system plans or traffic handling plans if the traffic control is not functioning as required due to changes in traffic or site conditions. Do not implement any changes to the traffic control system plans or traffic handling plans until the proposed revisions are authorized.

12-4.02C(11)(d) Payment

Not Used

12-4.02C(12) Construction Work Zone Speed Limit Reduction

Reserved

12-4.02C(13) Traffic Control Supervision

Reserved

12-4.02C(14)–12-4.02C(25) Reserved

10-18-19

12-4.02D Payment

The Department pays for change order work for a traffic control system by force account for increased traffic control and uses a force account analysis for decreased traffic control.

The Department does not pay for furnishing, placing, relocating, and removing PCMSs used for a traffic break.

The Department deducts the full cost of COZEEP support provided for the traffic break.

The hourly rate for each California Highway Patrol officer providing COZEEP support is \$115. This rate includes full compensation for each hour or portion thereof that the officer provides the support. Markups are not added to any expenses associated with COZEEP support.

The minimum number of hours for an officer is 4 hours, except if a closure is already in place and the Engineer authorizes your request for an on-duty officer to conduct a traffic break, the minimum number of hours for an officer is 1 hour.

For a cancellation less than 48 hours before the scheduled start time of COZEEP support, except for a cancellation due to adverse weather or extenuating circumstances, the Department deducts:

1. Minimum of \$50 per California Highway Patrol officer if the officer is notified before the start time
2. Maximum of 4 hours of pay per officer if the officer is not notified before the start time

12-4.03 FALSEWORK OPENINGS

04-17-20

12-4.03A General

Section 12-4.03 includes specifications for providing falsework openings.

12-4.03B Materials

Not Used

12-4.03C Construction

12-4.03C(1) General

Reserved

12-4.03C(2) Temporary Railing

Install Type K temporary railing on both sides of vehicular openings through falsework. If ordered, install temporary railing at other falsework less than 12 feet from the edge of a traffic lane. This is change order work.

Temporary railings for vehicular openings must start 150 feet in advance of the falsework and extend past the falsework in the direction of adjacent traffic flow. For 2-way traffic openings, temporary railing must extend at least 60 feet past the falsework in the direction of adjacent traffic flow.

Install temporary crash cushion modules as shown at the approach end of temporary railings located less than 15 feet from the edge of a traffic lane. For 2-way traffic openings install temporary crash cushion modules at the departing end of temporary railings located less than 6 feet from the edge of a traffic lane.

10-15-21

The Engineer determines the exact location and length of temporary barrier system and the type of flare to be used.

04-17-20

Install temporary railing for protecting the falsework before erecting it. Do not remove temporary railing until authorized.

12-4.03D Payment

Not Used

12-4.04 TEMPORARY PEDESTRIAN ACCESS ROUTES

12-4.04A General

12-4.04A(1) Summary

Section 12-4.04 includes specifications for providing, maintaining, and removing temporary pedestrian access routes.

A temporary pedestrian access route includes temporary traffic control devices as shown except for Type K temporary railing and temporary crash cushions.

12-4.04A(2) Definitions

Reserved

12-4.04A(3) Submittals

If work activities require the closure of a pedestrian route and a temporary pedestrian access route is not shown, submit a work plan for a temporary pedestrian access route. The work plan must:

1. Describe the activities, processes, equipment, and materials that will be used to provide the temporary access route
2. Show the locations of the routes and the placement of traffic control devices for each stage of work
3. Include a time-scaled logic diagram displaying the sequence and duration of the planned activities for each stage of work
4. Be sealed and signed by an engineer who is registered as a civil engineer in the State

Submit "Temporary Pedestrian Access Route Contractor Compliance Report," within 2 business days after construction of a temporary pedestrian access route.

Submit "Temporary Pedestrian Access Route Contractor Weekly Report," within 2 business days of completing a weekly inspection.

12-4.04A(4) Quality Assurance

12-4.04A(4)(a) General

Reserved

12-4.04A(4)(b) Quality Control

Perform a review of the temporary pedestrian access route after it is constructed and document compliance on the "Temporary Pedestrian Access Route Contractor Compliance Report."

The Department will conduct a verification inspection after receiving the compliance report.

For a temporary pedestrian access route in use perform a weekly review and document compliance on the "Temporary Pedestrian Access Route Contractor Weekly Report."

12-4.04B Materials

The walkway surface must be slip resistant and surfaced with minor HMA or commercial-quality, bituminous material, commercial-quality concrete, or wood.

A handrail with a circular cross section must have an outer diameter from 1-1/4 to 2 inches. A handrail with a noncircular cross section must have a perimeter from 4 to 6-1/4 inches and a maximum cross-section dimension of 2-1/4 inches.

Fasteners must be rounded to prevent injury to a pedestrian's fingers, hands, and arms and to eliminate sharp edges that could catch on clothing.

A detectable warning surface must be on the Authorized Material List for detectable warning surfaces and match yellow color no. 33538 of AMS.Std.595.

Temporary traffic control devices used to channelize pedestrians must:

1. Be free of sharp or rough edges

2. Have a continuous detectable edging at least 6 inches high and at no more than 2 inches above the walkway surface
3. Be at least 32 inches in height
4. Have smooth connection points between devices to allow for a handrail
5. Have a top and bottom surface in the same vertical plane

12-4.04C Construction

Notify the Engineer 5 business days before closing an existing pedestrian route. Do not close the route until authorized.

If work activities require the closure of a pedestrian route and a temporary pedestrian access route is not shown, provide a temporary pedestrian access route near the traveled way. You may route pedestrians using the existing sidewalk or by constructing a temporary access route.

If a bid item for a temporary pedestrian access route is not shown on the Bid Item List, then constructing a temporary pedestrian access route is change order work, except when the closure is a result of your means and methods.

Construct a temporary pedestrian access route such that:

1. Walkway surface is firm and stable and free of irregularities
2. Cross slope of the pedestrian route is at most 50:1 (horizontal:vertical)
3. Longitudinal slope of the pedestrian route is at most 20:1 (horizontal:vertical)
4. Walkway, landings, blended transitions, and curb ramps are at least 60 inches wide except where not feasible, the width must be at least 48 inches wide with a 60-by-60-inch passing space at least every 200 feet
5. Lateral joints or gaps between surfaces are less than 1/2 inch wide
6. Discontinuities in surface heights are less than 1/2 inch and beveled if greater than 1/4 inch with a slope no greater than 2:1 (horizontal:vertical)
7. Ramps have:
 - 7.1. Longitudinal slope of at most 12:1 (horizontal:vertical)
 - 7.2. Rise less than 30 inches
 - 7.3. Protective edging at least 2 inches high on each side and handrails at a height from 34 to 38 inches above the walkway surface if the rise is greater than 6 inches
8. Curb ramps have:
 - 8.1. Longitudinal slope of at most 12:1 (horizontal:vertical)
 - 8.2. Protective edging at least 2 inches high on each side if the curb ramp does not have flares and the rise is greater than 6 inches
9. Pedestrians are channelized when routed off existing pedestrian routes

Construct handrails such that they are continuous, smooth and free of sharp or rough edges.

Provide an overhead covering to protect pedestrians from falling objects and drippings from overhead structures.

If the temporary access route is next to traffic or work activities, place a temporary barrier to separate the route from vehicles and equipment.

Install a detectable warning surface at locations where a curb ramp, landing, or blended transition connects to a street. Install the warning surface such that it extends a minimum of 36 inches in the direction of travel and for the full width of the landing, blended transition, or curb ramp, excluding the flares.

Maintain the temporary pedestrian access route clear of obstructions. Do not allow traffic control devices, equipment, or construction materials to protrude into the walkway. Maintain a continuous unobstructed path connecting all pedestrian routes, parking lots, and bus stops located within the project limits.

Remove the temporary pedestrian access route when the Engineer determines it is no longer needed.

Provide a temporary pedestrian access route through falsework under section 16-2.02.

12-4.04D Payment

Not Used

12-4.05 BRIDGE CLEANING AND PAINTING ACTIVITIES

12-4.05A General

Section 12-4.05 includes specifications for maintaining traffic during bridge cleaning and painting activities.

Signs must comply with section 12-3.11.

12-4.05B Materials

Not Used

12-4.05C Construction

For bridge cleaning and painting activities, place the signs as shown in the following table in addition to those shown on the plans:

Sign no.	Sign description	Requirement
W20-1	Road Work Ahead	Place portable 30-by-30-inch signs at locations where traffic approaches a bridge with work underway. If the approach speed is greater than 50 mph, the sign must be 48 by 48 inches. The sign panel base material must not be plywood. Attach 2 orange, 16 sq in flags to each sign.
--	Cleaning and Painting Operations	Place a 48-by-48-inch sign near each W20-1 sign. Use 4-inch-high black lettering and include your name, address, and telephone number on an orange background.

The Engineer determines the exact locations of the signs. Do not use signs until needed. Maintain the signs in place during bridge cleaning and painting activities. Remove the signs at the end of each work shift.

After each day's bridge cleaning and painting activities, remove obstructions from the roadway to allow for free passage for traffic. Remove blast cleaning residue from the traveled way before opening the area to traffic.

You may lay supply lines along the top of curbs adjacent to railing posts if the lines do not interfere with traffic. Remove the lines when work is not in progress.

12-4.05D Payment

Not Used

12-4.06 TOLL BRIDGES

Reserved

12-4.07–12-4.10 RESERVED

12-5 RESERVED

12-6 TEMPORARY PAVEMENT DELINEATION

12-6.01 GENERAL

Section 12-6 includes specifications for placing temporary pavement delineation except for delineation on a seal coat project.

Temporary painted traffic stripes and painted pavement markings used for temporary delineation must comply with section 84-2.

Temporary signs for no-passing zones must comply with section 12-3.11.

12-6.02 MATERIALS

12-6.02A General

The following types of temporary pavement delineation must be on the Authorized Material List for signing and delineation materials:

1. Temporary pavement markers for long term day/night use (180 days or less)
2. Temporary pavement markers for short term day/night use (14 days or less)
3. Temporary (removable) striping and pavement marking tape (180 days or less)
4. Permanent traffic striping and pavement marking tape
5. Channelizers

12-6.02B Temporary Pavement Markers

Temporary pavement markers must be the same color as the lane line or centerline markers being replaced.

Temporary pavement markers must be for long-term day or night use, 180 days or less, except you may use temporary pavement markers for short-term day or night use, 14 days or less, if you place the permanent pavement delineation before the end of the 14 days.

12-6.02C Channelizers

Channelizers used for temporary edge line delineation must be orange and surface mounted.

12-6.03 CONSTRUCTION

12-6.03A General

If work activities obliterate pavement delineation, place temporary or permanent pavement delineation before opening the traveled way to traffic. The temporary pavement delineation must consist of a lane line and centerline pavement delineation for traveled ways open to traffic. On multilane roadways, freeways, expressways, and 2-lane roadways with shoulders 4 feet or more in width, the temporary pavement delineation must also include edge line delineation for traveled ways open to traffic.

Establish the alignment for temporary pavement delineation, including the required lines or markers. Surfaces to receive an application of paint or removable traffic tape must be dry and free from dirt and loose material. Do not apply temporary pavement delineation over existing pavement delineation or any other temporary pavement delineation. Maintain temporary pavement delineation until no longer needed or replace it with a new striping detail of temporary or permanent pavement delineation.

When the Engineer determines the temporary pavement delineation is no longer required for the direction of traffic, remove the temporary pavement delineation, including any underlying adhesive for temporary pavement markers, from the final layer of surfacing and from the pavement to remain in place. Remove temporary pavement delineation that conflicts with any subsequent or new traffic pattern for the area.

12-6.03B Temporary Lane Line and Centerline Delineation

If lane lines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown, the minimum lane line and centerline delineation must consist of temporary pavement markers placed longitudinally at 24-foot maximum intervals.

For temporary lane line or centerline delineation consisting entirely of temporary pavement markers for short-term day or night use, 14 days or less, do not use the markers for more than 14 days on lanes opened to traffic. Place the permanent pavement delineation before the end of the 14 days. If the permanent pavement delineation is not placed within 14 days, replace the temporary pavement markers with additional temporary pavement delineation equivalent to the pattern described for the permanent pavement delineation for the area.

If no-passing centerline pavement delineation is obliterated, install the following temporary no-passing zone signs before opening lanes to traffic:

1. W20-1 (Road Work Ahead) sign from 1,000 to 2,000 feet in advance of the no-passing zone
2. R4-1 (Do Not Pass) sign at the beginning of the no-passing zone and at 2,000-foot maximum intervals within the no-passing zone
3. W7-3a (Next ___ Miles) plaque beneath the W20-1 sign for continuous zones longer than 2 miles

4. R4-2 (Pass With Care) sign at the end of the no-passing zone

The Engineer determines the exact location of temporary no-passing zone signs. Maintain the temporary no-passing zone signs in place until you place the permanent no-passing centerline pavement delineation.

Remove the temporary no-passing zone signs when the Engineer determines they are no longer required for the direction of traffic.

12-6.03C Temporary Edge Line Delineation

On multilane roadways, freeways, expressways, and 2-lane roadways with shoulders 4 feet or more in width open to traffic where edge lines are obliterated and temporary pavement delineation to replace those edge lines is not shown, provide temporary pavement delineation for:

1. Right edge lines consisting of any of the following:
 - 1.1. Solid 6-inch-wide traffic stripe tape of the same color as the stripe being replaced.
 - 1.2. Traffic cones placed longitudinally at 100-foot maximum intervals.
 - 1.3. Portable delineators or channelizers placed longitudinally at 100-foot maximum intervals.
2. Left edge lines consisting of any of the following:
 - 2.1. Solid 6-inch-wide traffic stripe tape of the same color as the stripe being replaced.
 - 2.2. Traffic cones placed longitudinally at 100-foot maximum intervals.
 - 2.3. Portable delineators or channelizers placed longitudinally at 100-foot maximum intervals.
 - 2.4. Temporary pavement markers placed longitudinally at 6-foot maximum intervals.

You may apply temporary traffic stripe paint of the same color as the stripe being replaced instead of solid 6-inch-wide temporary traffic stripe tape where the removal of the temporary traffic stripe is not required.

The Engineer determines the lateral offset for traffic cones, portable delineators, and channelizers used for temporary edge line delineation. If traffic cones or portable delineators are used for temporary edge line delineation, maintain the cones or delineators during the hours of the day when they are in use.

Cement the bases of channelizers used for temporary edge line delineation to the pavement with hot melt bituminous adhesive as specified in section 81-3 for cementing pavement markers to pavement.

12-6.03D Temporary Traffic Stripe, Pavement Marking, and Pavement Markers

12-6.03D(1) General

Reserved

12-6.03D(2) Temporary Traffic Stripe Tape

Except where the temporary traffic stripe is used for 14 days or less, apply temporary removable traffic stripe tape under the manufacturer's instructions and as follows:

1. Slowly roll the tape with a rubber-tired vehicle or roller to ensure complete contact with the pavement surface.
2. Apply the tape straight on a tangent alignment and on a true arc on a curved alignment.
3. Do not apply the tape when the ambient air or pavement temperature is less than 50 degrees F unless otherwise authorized.

For temporary traffic stripe tape used for 14 days or less, apply the temporary removable traffic stripe tape under the manufacturer's instructions.

12-6.03D(3) Temporary Traffic Stripe Paint

Apply temporary traffic stripe paint under section 84-2.03, except you may apply 1 or 2 coats of the temporary traffic stripe paint for new or existing pavement.

You are not required to remove painted temporary traffic stripe that will be covered by paving work.

12-6.03D(4) Temporary Pavement Marking Tape

Apply temporary removable pavement marking tape as specified for applying temporary removable traffic stripe tape in section 12-6.03D(2).

12-6.03D(5) Temporary Pavement Marking Paint

Apply temporary pavement marking paint under section 84-2.03, except you may apply 1 or 2 coats of the temporary pavement marking paint.

You are not required to remove of painted temporary pavement markings that will be covered by paving work.

You may use permanent or temporary removable pavement marking tape instead of temporary pavement marking paint.

12-6.03D(6) Temporary Pavement Markers

Place temporary pavement markers under the manufacturer's instructions. Cement temporary markers to the surfacing with the manufacturer's recommended adhesive except do not use epoxy adhesive in areas where the removal of the pavement markers is required.

You may use retroreflective pavement markers instead of temporary pavement markers for long-term day or night use, 180 days or less, except to simulate patterns of broken traffic stripe. Retroreflective pavement markers used for temporary pavement markers must comply with section 81-3, except the waiting period before placing pavement markers on new asphalt concrete surfacing as specified in section 81-3.03 does not apply. Do not use epoxy adhesive to place pavement markers in areas where the removal of the pavement markers is required.

12-6.04 PAYMENT

The Department does not pay for additional temporary pavement delineation used to replace temporary pavement markers.

Temporary traffic stripe is measured as specified for traffic stripe in section 84.

Temporary pavement marking is measured as specified for pavement marking in section 84.

12-7 TEMPORARY PAVEMENT DELINEATION FOR SEAL COATS

12-7.01 GENERAL

Section 12-7 includes specifications for placing temporary pavement delineation for a seal coat project.

Temporary signs for no-passing zones must comply with section 12-3.11.

12-7.02 MATERIALS

Temporary raised pavement markers for seal coat applications must be temporary pavement markers for short-term day or night use, 14 days or less, on the Authorized Material List for signing and delineation materials.

12-7.03 CONSTRUCTION

Before applying binder that will obliterate existing traffic stripes, place temporary raised pavement markers on the existing traffic stripes except for right edge lines at 24-foot maximum intervals. Place 2 markers side by side on double traffic stripes with 1 marker placed on each stripe longitudinally at 24-foot maximum intervals. Place temporary raised pavement markers under the manufacturer's instructions. Before opening the lanes to uncontrolled traffic, remove the covers from the temporary raised pavement markers.

If you obliterate no-passing centerline pavement delineation, install the following temporary no-passing zone signs before opening lanes to traffic:

1. W20-1 (Road Work Ahead) sign from 1,000 to 2,000 feet in advance of the no-passing zone
2. R4-1 (Do Not Pass) sign at the beginning of the no-passing zone and at 2,000-foot maximum intervals within the no-passing zone
3. W7-3a (Next ___ Miles) plaque beneath the W20-1 sign for continuous zones longer than 2 miles
4. R4-2 (Pass With Care) sign at the end of the no-passing zone

For training requirements, go to the Construction Storm Water and Water Pollution Control website.

Replace the 1st paragraph of section 13-1.01D(4)(a) with:

04-17-20

Assign a WPC manager to implement the WPCP or SWPPP. Assign an alternate WPC manager to perform the responsibilities of the WPC manager in the manager's absence. The alternate WPC manager must have the same qualifications as the WPC manager. You may assign an assistant WPC manager to act under the supervision of the WPC manager to inspect, repair, and maintain WPC practices, collect water quality samples, and record water quality data. You may have more than one assistant WPC manager.

Replace the 1st paragraph of section 13-1.01D(4)(b) with:

04-17-20

The WPC manager must:

1. Comply with the requirements provided in the Construction General Permit for QSP
2. Comply with the requirements described under "WPC Manager Training," including:
 - 2.1. Obtaining a certificate by completing the 8-hour training
 - 2.2. Reviewing updates, revisions, and amendments to the training

For the requirements, go to the Construction Storm Water and Water Pollution Control website.

Delete item 2.6.3 in the list of section 13-1.01D(4)(c).

04-19-19

Replace item 7 in the list in the 1st paragraph of section 13-1.01D(4)(c) with:

04-17-20

7. Revise the WPCP or recommend changes to the SWPPP

Replace the 3rd sentence in the 4th paragraph of section 13-1.03A with:

04-17-20

Additional WPC work is change order work except when the additional WPC practices are a result of your means and methods.

Replace the 1st paragraph of section 13-2.01C with:

04-19-19

Within 7 days after Contract approval, submit one printed copy and an electronic copy on a read-only CD, DVD, or other authorized data-storage device of your WPCP unless different quantities are ordered at the preconstruction conference. You may assign a QSP other than the WPC manager to develop the WPCP.

Replace item 4 in the list in the 2nd paragraph of section 13-2.01C with:

04-19-19

4. Show the locations and types of temporary WPC practices that will be used in the work for whichever has the longest duration in the first:
 - 4.1. 60 days
 - 4.2. Construction phase

Replace item 7 in the list in the 2nd paragraph of section 13-2.01C with:

10-16-20

7. Include a copy of each permit obtained by the Department, such as the Department of Fish and Wildlife permits, US Army Corps of Engineers permits, RWQCB 401 certifications, Docket No. ESPO-SMA 15/16-001 Soil Management Agreement for Aerially Deposited Lead-Contaminated Soils with the DTSC (ADL Agreement), ADL Agreement notification, and RWQCB waste discharge requirements for reuse of aerially deposited lead

Replace the 4th paragraph of section 13-2.01C with:

04-19-19

After the Engineer authorizes the WPCP, submit one printed copy and an electronic copy on a read-only CD, DVD, or other Engineer-authorized data-storage device of the authorized WPCP.

Delete the row for Annual Certification in the table in section 13-3.01C(1).

04-19-19

Replace the 1st paragraph of section 13-3.01C(2)(a) with:

04-17-20

Within 15 days of Contract approval, submit 1 printed copy and an electronic copy on a read-only CD, DVD, or other authorized data-storage device of your SWPPP unless different quantities are ordered at the preconstruction conference.

You must assign a QSD to develop and revise the SWPPP.

Replace item 4 in the list in the 2nd paragraph of section 13-3.01C(2)(a) with:

04-19-19

4. Include a schedule showing when:
 - 4.1. Work activities that could cause the discharge of pollutants into stormwater will be performed
 - 4.2. WPC practices, including soil stabilization and sediment control, that will be used in the work for whichever has the longest duration in the first:
 - 4.2.1. 60 days
 - 4.2.2. Construction phase

Replace item 5 in the list in the 2nd paragraph of section 13-3.01C(2)(a) with:

10-16-20

5. Include a copy of each permit obtained by the Department, such as the Department of Fish and Wildlife permits, US Army Corps of Engineers permits, RWQCB 401 certifications, Docket No. ESPO-SMA 15/16-001 Soil Management Agreement for Aerially Deposited Lead-Contaminated Soils with the DTSC (ADL Agreement), ADL Agreement notification, and RWQCB waste discharge requirements for aerially deposited lead reuse

Replace the 4th paragraph of section 13-3.01C(2)(a) with:

04-19-19

Submit an electronic copy on a read-only CD, DVD, or other Engineer-authorized data-storage device and 4 printed copies of the authorized SWPPP unless fewer quantities are authorized at the preconstruction conference.

Replace the introductory clause in the 7th paragraph of section 13-3.01C(2)(a) with:

14 ENVIRONMENTAL STEWARDSHIP

10-15-21

Replace section 14-6.05 with:

10-15-21

14-6.05 INVASIVE SPECIES CONTROL

Reserved

Add between the 3rd and 4th paragraphs of section 14-10.01:

04-19-19

If ordered, remove solid waste from illegal dumping on the project site. This work is change order work. Illegal dumping is:

1. Third party nonhazardous residential or commercial waste
2. Greater than 1.0 cubic yard per event

Replace section 14-10.03 with:

04-16-21

14-10.03 RECYCLED MATERIALS REPORTING

Submit a Recycled Materials Report form within 5 business days after Contract acceptance. Show the types and amounts of recycled materials incorporated into the project.

If you fail to submit a completed report, the Department deducts \$10,000.

Replace section 14-11.05A with:

10-18-19

14-11.05A General

Do not stockpile material containing hazardous waste or contamination unless authorized in your excavation and transportation plan. Stockpiles containing hazardous waste or contamination must not be placed where affected by surface run-on or run-off. Cover stockpiles with a minimum 12-mils-thick plastic sheeting. Do not place stockpiles in ESAs. Stockpiled material must not enter storm drains, inlets, or waters of the State.

Replace section 14-11.14 with:

11-19-20

14-11.14 TREATED WOOD WASTE

Reserved

Replace *Reserved* in section 14-11.15 with:

04-17-20

14-11.15A General

Section 14-11.15 includes specifications for disposing of electrical equipment containing hazardous materials.

14-11.15B Submittals

14-11.15B(1) General

Reserved

14-11.15B(2) Identification of Disposal Facilities

Thirty days before starting work submit the name and address of the appropriately permitted facilities where electrical equipment containing hazardous materials will be taken to dispose or recycle them.

14-11.15C Waste Management

14-11.15C(1) General

When you mishandle and damage electrical equipment you are the generator of resulting hazardous waste and are responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

14-11.15C(2) Universal Waste

14-11.15C(2)(a) General

Universal wastes include removed:

1. Light bulbs
2. E-waste including, electronic devices as described in 22 CA Code Regs § 66273.3(a), containing:
 - 2.1. Circuit boards, including controller boxes and LED lights
 - 2.2. Computer screens or video screens
 - 2.3. Computer keyboards
 - 2.4. Cathode ray tube devices
3. Batteries as described in 22 CA Code Regs § 66273.2
4. Mercury-containing equipment as described in section 22 CA Code Regs §66273.4(a); such as lamps, timers, and switches
5. Fluorescent tubes, bulbs, and lamps

Manage and dispose of universal waste under 22 CA Code Regs § 66261.9. Transport universal wastes to an appropriately permitted recycling or disposal facility.

14-11.15C(2)(b) Undamaged Lithium Thionyl Chloride batteries

Package removed equipment containing undamaged lithium thionyl chloride batteries and place the packages in US DOT approved sealed shipping containers. Transport the containers to a recycling or disposal facility. Notify the receiving facility 48 hours before delivery. Affix a label to containers of intact units identifying the contents as "Universal Waste: Lithium Thionyl Chloride Batteries."

Ship lithium thionyl chloride batteries that are separated from the electrical equipment units they powered to a recycling or disposal facility under 49 CFR 173.185. Package the batteries such that contact between them and resulting short circuits are avoided. Prevent accidental contact between batteries by:

1. Covering terminal ends to prevent them from touching each other
2. Placing batteries in a sealed plastic bag packed with loose fill, such as vermiculite

The outer packaging must comply with 49 CFR 173.24 and 173.24a. Transport lithium thionyl chloride batteries to an approved hazardous waste recycling or disposal facility. For a partial list of facilities, go to:

<http://www.calrecycle.ca.gov/Electronics/Recovery/Approved/Default.htm>

14-11.15C(3) Damaged Lithium Thionyl Chloride batteries

Damaged Lithium thionyl chloride batteries are designated as an extremely hazardous waste under 22 CA Code of Regs, Div 4.5, Ch 11, Art 5, App 10.

When lithium thionyl chloride batteries are damaged by your mishandling you are the generator of the resulting hazardous waste and responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

Lithium thionyl chloride batteries found damaged are Department-generated hazardous waste under section 14-11.07. Management of this Department-generated hazardous waste is change order work.

Use a hazardous waste manifest to transport this damaged equipment to an appropriately permitted disposal facility.

14-11.15C(4) Electrical Equipment Containing PCBs

14-11.15C(4)(a) General

PCBs are found in electrical equipment produced before 1979 such as transformers, capacitors, and fluorescent light ballasts.

14-11.15C(4)(b) Transformers and Capacitors

Manage and dispose of transformers and capacitors containing PCBs under 40 CFR Part 761 and 22 CA Code of Regs Div 4.5.

14-11.15C(4)(c) Undamaged Fluorescent Light Ballasts

Manage and dispose of fluorescent light ballasts containing PCBs under 22 CA Code of Regs § 67426.1 et seq. Fluorescent light ballasts containing PCBs must be packaged and transported by a hauler with a current DTSC registration certificate and documentation of compliance with the CA Highway Patrol Basic Inspection of Terminals Program. The hauler must transport the fluorescent light ballasts containing PCBs to a facility permitted for hazardous waste disposal by DTSC.

14-11.15C(4)(d) Damaged Fluorescent Light Ballasts

Damaged fluorescent light ballasts containing PCBs are designated as extremely hazardous waste by DTSC.

When fluorescent light ballasts containing PCBs are damaged by your mishandling you are the generator of the resulting hazardous waste and responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

Fluorescent light ballasts containing PCBs found damaged are Department-generated hazardous waste under section 14-11.07. Management of this Department-generated hazardous waste is change order work.

Use a hazardous waste manifest to transport damaged equipment to an appropriately permitted disposal facility.

14-11.15C(5) Lead Acid Batteries

Removed lead acid batteries are Department-generated hazardous waste. Manage hazardous waste lead acid batteries under 22 CA Code Regs § 66266.80 and 66266.81. Do not dispose of or attempt to dispose of, a lead-acid battery on or in any land, including dumpsters, landfills, lakes, streams, or the ocean.

Upon removal immediately place batteries upright in non-reactive, structurally-secure, closed containers such as polyethylene buckets or drums for transport. Package the batteries under 49 CFR 172.101 and 49 CFR 173.59. Prevent accidental contact between batteries by:

1. Covering terminal ends to prevent them from touching each other
2. Placing batteries in a sealed plastic bag packed with loose fill, such as vermiculite

Label the container with the date the first battery is placed in it and identify the contents as "Lead-acid Batteries."

Use a:

- 1 Bill of lading under 13 CCR § 1161 for shipments of 9 or less batteries.
2. Hazardous waste manifest for shipments of 10 batteries or more. The Engineer provides the Department's EPA Generator Identification Number for hazardous waste shipment. The Engineer signs the hazardous waste manifests. Notify the Engineer 5 business days before the manifests are to be signed.

Outer packaging must comply with 49 CFR 173.24. Transport batteries to a DTSC permitted recycling facility.

14-11.15C(6) Photovoltaic Panels

Removed photovoltaic panels are Department-generated hazardous waste due to heavy metals content. Manage and dispose of photovoltaic panels under section 14-11.07.

AA

15 EXISTING FACILITIES

10-16-20

Replace item 1.3 in the list in the 7th paragraph of section 15-1.03B with:

- 1.3. Buried at least 10 feet from the dripline of trees or highway facilities

10-16-20

AA

16 TEMPORARY FACILITIES

10-15-21

Replace the 1st paragraph of section 16-2.02A(1) with:

Section 16-2.02 includes specifications for constructing temporary pedestrian facilities with a protective overhead covering.

10-15-21

Replace section 16-2.02C with:

10-15-21

16-2.02C Construction

If the temporary pedestrian facility is adjacent to traffic or work activities, place a temporary barrier to separate the facility from vehicles and equipment.

Construct handrails on each side of a temporary pedestrian facility as necessary to channelize and protect pedestrians. Handrails must be continuous smooth and free of sharp or rough edges.

Provide an overhead covering, to protect pedestrians. Extend overhead protection for pedestrians at least 4 feet beyond the edge of the work above. Illuminate pedestrian openings through falsework at all times.

The minimum width between the inside face of the handrails must be at least 60 inches. In areas where a width of 60 inches is not feasible, the width must be at least 48 inches wide with a 60 by 60 inch passing space at least every 200 feet. The clear height of the facility measured from the floor surface to the canopy overhead must be at least 8 feet but not greater than 10 feet.

Temporary pedestrian facilities must comply with section 12-4.04C.

AA

DIVISION III EARTHWORK AND LANDSCAPE

19 EARTHWORK

04-15-22

Replace item 1 in the list in the 2nd paragraph of section 19-3.01A with:

04-15-22

- 1. Excavating foundations for structures, including trenches for culverts, slope protection, pipes, rods, deadmen, cutoff walls, and other facilities

Replace section 19-3.01C(4) with:

04-17-20

19-3.01C(4) Ground Anchor and Soil Nail Walls

Submit shop drawings for earthwork for each ground anchor wall and soil nail wall under section 46-1.01C(2).

Delete the 5th paragraph of section 19-3.02C.

10-16-20

Replace section 19-3.02H with:

10-15-21

19-3.02H Concrete Backfill

19-3.02H(1) General

Reserved

19-3.02H(2) Steel Soldier Piles

Concrete backfill must:

1. Comply with section 90-1
2. Contain at least 505 pounds of cementitious material per cubic yard

Concrete backfill placed under slurry must comply with the requirements above and:

1. Comply with the combined aggregate gradation requirements of 1/2-inch or 3/8-inch maximum gradation as specified in section 90-1.02C(4)(d).
2. Have a slump of 7 to 9 inches. The nominal and maximum slump and penetration in section 90-1.02G(6) do not apply.

Replace the 1st paragraph of section 19-3.03E(1) with:

10-19-18

Place structure backfill in uniform layers. Bring backfill up uniformly on all sides of structures or drainage facilities. Backfill layer thickness must not exceed 0.67 foot before compacting. If you perform compaction by ponding and jetting, the thickness of the backfill layer must not exceed 4 feet.

Replace the 1st sentence in the 3rd paragraph of section 19-3.03E(1) with:

10-19-18

Do not place structure backfill until footings or other parts of structures or drainage facilities are authorized.

Replace section 19-3.03E(2) with:

10-16-20

19-3.03E(2) Reserved

Replace the 2nd paragraph of section 19-3.03K with:

10-16-20

Clean the excavated face of loose materials, mud, rebound, and other materials that prevent or reduce the shotcrete from bonding to soil nails and the receiving surface.

Delete section 20-2.01A(4)(e).

10-19-18

Replace the 2nd and 3rd paragraphs of section 20-2.01B(3) with:

04-15-22

Each warning sign must:

1. Be PS-013(CA) or S28(CA) and comply with the *California MUTCD*
2. Be UV fade and weather resistant and manufactured from flexible vinyl with or without mylar
3. Have a self-adhesive backing

Each warning decal must meet water supplier requirements and:

1. Show the phrase *Recycled Water, Do Not Drink* and the drinking-glass graphic symbol
2. Be UV fade and weather resistant and manufactured from flexible vinyl with or without mylar
3. Have a purple background, white text, and self-adhesive backing

Replace the 1st paragraph of section 20-2.01B(5) with:

10-19-18

Pull boxes must comply with section 86-1.02C and be no. 5 or larger. Pull boxes for low voltage conductors must not have side openings.

Replace the 2nd paragraph of section 20-2.01B(5) with:

04-19-19

Pull box covers used for control and neutral conductors for irrigation equipment operated by the irrigation controller must be marked *SPRINKLER CONTROL*.

Add to section 20-2.01B:

04-19-19

20-2.01B(9) Woven Wire Cloth and Gravel

Woven wire cloth must be galvanized and manufactured with a minimum diameter of 19-gauge wire and have square openings from 1/4 to 1/2 inches.

Gravel must be 3/4-inch gravel or crushed rock. Gravel or crushed rock must be clean, washed, dry, and free from clay or organic material.

Replace the 1st paragraph of section 20-2.01C(2) with:

10-19-18

Perform trenching and backfilling under section 87-1.03E(2).

Replace the introductory clause to the list in the 1st paragraph of section 20-2.01C(3) with:

10-19-18

Install pull boxes under section 87-1.03C at the following locations:

Add to section 20-2.01C(4):

04-19-19

Install valve boxes on woven wire cloth and gravel or crushed rock.

Add to the end of section 20-2.01C(4):

04-17-20

Space remote control valve boxes at least 2 feet from the edge of the adjacent valve box.

Replace items 1 and 2 in the list of section 20-2.02B(4) with:

10-15-21

1. Be made with a 10-gauge minimum-thickness Type 304 stainless steel sheet
2. Have expanded metal side, end, and top panels with openings of approximately 3/4 by 1-3/4 inches

Replace the 1st paragraph of section 20-2.04A(4) with:

10-19-18

Perform field tests on control and neutral conductors. Field tests must comply with the specifications in section 87-1.01D(2)(a).

Replace the 1st and 2nd paragraphs of section 20-2.04B with:

10-19-18

Control and neutral conductors must comply with the provisions for conductors and cables in section 86-1.02F.

Electrical conduit and fittings must comply with section 86-1.02(B).

Replace the 1st paragraph of section 20-2.04C(4) with:

04-19-19

Splice conductors with a UL-listed connector manufactured for copper wire, direct burial irrigation systems. Connector must be prefilled with a moisture sealing compound that encapsulates and protects the splice in a waterproof housing. Connector must be sized for the number and gauge of the conductors at the splice.

Add to the end of the 4th paragraph of section 20-2.06B(2)(a):

10-18-19

Notify the Engineer at least 10 business days before accessing the network communications to integrate new irrigation controllers into the network.

Replace the introductory clause of the 1st paragraph of section 20-2.06B(3) with:

10-19-18

The irrigation controller enclosure cabinet must comply with section 86-1.02Q and must:

Add to the beginning of section 20-2.06C:

10-19-18

Install the irrigation controller enclosure cabinet under 87-1.03Q(1).

Replace the paragraph of section 20-2.07B(3) with:

10-18-19

Corrugated HDPE pipe must comply with ASTM F667 or be Type S complying with AASHTO M252 or AASHTO M294. Couplings and fitting must be as recommended by the pipe manufacturer.

Replace section 20-2.07B(5) with:

04-16-21

20-2.07B(5) PVC Pipe Conduit and PVC Pipe Conduit Sleeve

PVC pipe conduit and PVC pipe conduit sleeve must be schedule 40 complying with ASTM D1785.
Fittings must be schedule 80.

Replace section 20-2.07C(3) with:

04-16-21

20-2.07C(3) PVC Pipe Conduit and PVC Pipe Conduit Sleeve

Where shown, install PVC pipe conduit and PVC pipe conduit sleeve under surfacing. PVC pipe conduit under surfacing must be installed using directional boring under section 20-2.07C(2)(b).
Cap ends of conduit until used.

Replace the 3rd paragraph of section 20-2.09B(1) with:

04-19-19

Threaded nipples for swing joints and risers must be schedule 80, PVC 1120 or PVC 1220 pipe, and comply with ASTM D1785..

Replace the 1st sentence in the 5th paragraph of section 20-2.09B(1) with:

04-15-22

Flexible hose for sprinkler assemblies must be leak-free, non-rigid and comply with ASTM D2287.

Add to the end of section 20-2.10B(6):

10-18-19

Flanged adapters used to connect pipe to gate valves must be metal.

Replace section 20-2.10B(7) with:

04-17-20

Each pressure regulating valve used on the downstream side of the control valves must be:

1. Threaded type with outflow pressure clearly marked on the regulator
2. Plastic body with a working pressure of 125 psi or greater
3. Stainless-steel compression spring

Each pressure regulating valve used on the upstream side of the control valves must be:

1. Flanged or threaded and manufactured of brass or bronze
2. Capable of withstanding a working pressure of 300 psi or greater
3. Adjustable with a stainless-steel spring and seat
4. Tapped and plugged for a pressure gauge and if shown with a gauge installed

Add to section 20-2.10B:

04-16-21

20-2.10B(11) Automatic Flush Valve

Automatic flush valve body must be one-piece thermoplastic threaded type. The body must be serviceable by unthreading the valve from the male adapter. The body must use a molded synthetic

rubber seal. Valve must open automatically. The seat must be constructed of molded synthetic rubber that is held in the open position with a stainless steel spring. Flush rate must be at least 1.5 gpm at 60 psi.

20-2.10B(12) Air or Vacuum Relief Valve

Air relief valve body must be thermoplastic. Valve must be continuous acting air vent type. Valve must have a minimum release rate volume of 260 cfm at 5 psi.

Add to section 20-2.10C:

04-16-21

20-2.10C(8) Automatic Flush Valve

Install automatic flush valve under manufacturer's instructions. Valve box must contain a gravel bed that will absorb at least 1 gpm of water.

20-2.10C(9) Air Relief Valve

Install air relief valve under the manufacturer's instructions.

Replace the 1st paragraph of section 20-2.11C with:

04-16-21

Install wye strainer assembly on the upstream side of the control valve.

Replace item 1 in the list in the paragraph of section 20-2.13B(2)(d) with:

04-15-22

1. 2-piece, high-density, injection-molded polyethylene and must have a nonconductive inner liner with hot-dip galvanized nuts and bolts.

Replace item 1 in the list in the paragraph of section 20-2.13C(2)(e) with:

04-15-22

1. 2-piece, 8-inch, 14-gauge epoxy-coated or galvanized steel band. The band must be four 2-inch-wide glass-reinforced polyester or polyethylene runners, with hot-dip galvanized nuts and bolts.

Add between the 2nd and 3rd paragraphs of section 20-3.01A(3)(a):

04-15-22

Submit a copy of the mycorrhizae manufacturer's product data sheet showing:

1. Name, address, telephone number and web address of the manufacturer
2. Date of manufacturing
3. Species of fungi
4. Spores per gram for each species
5. Ingredients other than fungi

Replace the 1st paragraph of section 20-3.01A(3)(c) with:

04-15-22

Submit a certificate of compliance for sod, soil amendment and plant tubes.

Replace the table in the 3rd paragraph of section 20-3.01B(2)(a) with:

10-19-18

Plant group designation	Description	Container size (cu in)
A	No. 1 container	152–251
B	No. 5 container	785–1242
C	Balled and burlapped	--
E	Bulb	--
F	In flats	--
H	Cutting	--
I	Pot	--
K	24-inch box	5775–6861
M	Liner ^a	--
O	Acorn	--
P	Plugs ^{a, b}	--
S	Seedling ^c	--
U	No. 15 container	2768–3696
Z	Palm Tree	--

^aDo not use containers made of biodegradable material.

^bGrown in individual container cells.

^cBare root.

Replace section 20-3.01B(2)(b) with:

10-15-21

20-3.01B(2)(b) Cuttings

20-3.01B(2)(b)(i) General

Cuttings must be taken from designated areas or you must make arrangements to supply cuttings. To obtain cuttings outside of project limits, but within the State right-of-way, contact the local district encroachment permit office.

Take cuttings randomly from healthy, vigorous plants free of pests and disease. Make cuts with sharp, clean tools. Clean and disinfect cutting tools before taking cuttings from a different cutting source and at the end of each day. Tree branch cuttings must be harvested from various trees within a stand.

Cuttings must not be harvested from more than 25 percent of an individual plant and not more than 50 percent from plants in the same area.

Cuttings must be covered and the ends kept wet until planted. Cuttings that have dried out or withered must be discarded.

20-3.01B(2)(b)(ii) Carpobrotus and Delosperma Cuttings

Carpobrotus cuttings must be a minimum of 10 inches in length and not have roots.

Delosperma cuttings must be a minimum of 6 inches in length and not have roots.

20-3.01B(2)(b)(iii) Willow and Cottonwood Cuttings

Willow and cottonwood cuttings must be:

1. Reasonably straight
2. Cut square above a leaf bud to form the tip
3. Cut at an approximate 45-degree angle at the base below a leaf bud
4. Cut square at the top above a leaf bud
5. Trim off leaves and branches flush with the cutting stem
6. From 20 to 24 inches in length
7. From 3/4 to 1-1/2 inches in diameter at the base of the cutting

Cuttings must be harvested from dormant plants after leaf drop and before buds open in early spring.

At least 50 percent of the base of the cuttings must be soaked for a minimum of 5 days, but not more than 30 days in fresh clean water to allow buds to swell prior to planting. Cuttings must be soaked in a shaded location until the time of planting. Cuttings that have been soaking for more than 30 days must be discarded.

20-3.01B(2)(b)(iv)–20-3.01B(2)(b)(viii) Reserved

Replace the introductory clause of the 1st paragraph of section 20-3.01B(4)(b) with:

10-19-18

Slow-release fertilizer must be a pelleted or granular form with a nutrient release over a 3 to 4 month period and be within the chemical analysis ranges shown in the following table:

Replace section 20-3.01B(5) with:

04-15-22

20-3.01B(5) Root Stimulants

20-3.01B(5)(a) General

Root stimulant must be in labeled containers showing weight and manufacturer's name.

20-3.01B(5)(b) Reserved

Add between the 1st and 2nd paragraphs of section 20-3.01C(1):

04-15-22

Apply mycorrhizae inoculant under the manufacturer's instructions within 1.5 years of manufacturing date at the locations, rates, sequence, and number of applications shown.

Replace section 20-3.01C(3) with:

10-19-18

Water plants as needed to keep the plants in a healthy growing condition.

Add to section 20-3.02C(3)(a):

04-16-21

Where plants are shown to be planted in RECP areas, cut the RECP to provide a planting hole with minimal damage to the RECP. Secure cuts and loose edges of the RECP with fasteners after plants have been planted. Fasteners must be steel staples complying with section 21-2.02R. If you substitute steel staples with an alternative attachment device, submit a sample of the device at least 5 business days for approval before its installation.

Replace the 12th paragraph of section 20-3.02C(3)(b) with:

10-15-21

Install the foliage protector as follows:

1. Cut the bottom of the wire cylinder to match the slope of the ground and bottom of the plant basin. Remove sharp points of wire by bending or blunting.
2. Install support stakes for foliage protectors vertically into the soil. Space the support stakes equally around the plant and root ball.
3. Wrap wire mesh around the plant to form a cylinder. Secure the cylinder to support stakes with 16-gauge tie wire. Verify that the cylinder is snug against the support stakes but loose enough to be raised after untying for work within the plant basin.
4. Install jute mesh cover over the foliage protector and secure with twine.

Replace section 20-3.02C(3)(d) with:

10-15-21

20-3.02C(3)(d) Cuttings, Liners, Pots, Plugs, and Seedling Plants

20-3.02C(3)(d)(i) General

Before planting, ensure the soil is moist to a minimum depth of:

1. 2 to 4 inches for *Carpobrotus* and *Delosperma* cuttings
2. 6 to 8 inches for liners, plugs, and seedling plants
3. 10 to 12 inches for willow and cottonwood cuttings and pots

If shown, apply fertilizer to cuttings, liners, pots, plugs and seedling plants. Water immediately after planting.

If shown, apply root stimulant before planting under the manufacturer's instructions.

If shown, install foliage protectors under section 20-3.02C(3)(b).

Dispose of trimmings and unused cuttings, plugs, and seedling plants.

Plant cuttings during the period specified. If cuttings, liners, pots, plugs, and seedling plants cannot be planted prior to the start of plant establishment work, plant them during the plant establishment period.

20-3.02C(3)(d)(ii) Carpobrotus and Delosperma Cuttings

When planting *Carpobrotus* and *Delosperma* cuttings, make sure a minimum of 2 nodes are covered with soil. Gently compact the soil around each cutting without damaging the cutting. The basal end of:

1. *Delosperma* cuttings must be at least 2 inches below the surface of the soil
2. *Carpobrotus* cuttings must be at least 4 inches below the surface of the soil

20-3.02C(3)(d)(iii) Willow and Cottonwood Cuttings

Excavate planting holes for willow and cottonwood cuttings perpendicular to the ground line, or at the angle shown. Ensure planting hole excavation is large enough to receive the cuttings and fertilizer without damaging the bark. If you encounter solid rock or other unyielding material when excavating for planting holes, excavate new holes and backfill the unused holes.

Plant the base of the cutting at least 10 to 12 inches deep with 3 to 5 bud scars exposed above the ground. If more than 5 bud scars are exposed, trim off the excess cutting length.

If shown, place fertilizer in the backfill of each cutting, from 6 to 12 inches below grade and approximately 1 inch from the cutting.

Backfill the plant holes with excavated material after planting. Distribute the excavated material evenly within the hole without clods, lumps, or air pockets. Compact the backfill so the cutting cannot be easily removed from the soil. Do not damage the cutting's bark.

20-3.02C(3)(d)(iv) Reserved

Replace item 3 in the list in the 2nd paragraph of section 20-4.01A with:

10-18-19

3. Controlling weeds and pests

Replace the 1st paragraph of section 20-4.03G with:

10-18-19

Operate the electric irrigation systems utilizing external weather, learned flow, and other system data inputs required to operate the system in the automatic mode, unless otherwise authorized.

Delete the 3rd paragraph of section 20-4.03G.

10-19-18

Replace the 1st paragraph of section 20-5.03A(2) with:

10-18-19

Preemergent must be granular oxadiazon.

Replace the paragraph of section 20-5.03A(3)(c) with:

10-18-19

After compaction, apply preemergent at the maximum label rate. Do not apply preemergent more than 12 inches beyond the inert ground cover limits. Complete the preemergent application and inert ground cover placement within the same day.

Replace section 20-5.03B(2)(b) with:

10-16-20

20-5.03B(2)(b) Concrete

Concrete must be minor concrete. Aggregate size must be from 3/8 to 3/4 inch.

Add to the end of section 20-5.03B(3):

10-19-18

If you are ordered to remove existing concrete below ground within the limits of the rock blanket, saw cut the concrete before removal. This work is change order work.

Replace the 1st paragraph of section 20-5.03C(3) with:

10-16-20

Place gravel and compact.

Replace section 20-5.04B(6) with:

10-16-20

20-5.04B(6) Pine Needle Mulch

Pine needle mulch must:

1. Be derived from pine needles
2. Be a blend of pine needles and not more than 25 percent by volume of bark, cones and small twigs
3. Contain at least 95 percent by volume pine needles from 4 to 12 inches in length
4. Not be crushed

Add between the 6th and 7th paragraphs of section 20-5.04C:

10-16-20

Place pine needle mulch uniformly without clumping.

Replace item 1 in the list in the 1st paragraph of section 20-10.03A(3) with:

10-19-18

1. Transplanting trees. The work plan must include methods of lifting, transporting, storing, planting, guying, watering and maintaining each tree to be transplanted. Include the root ball size, method of root ball containment, and a maintenance program for each tree.

9. Name and address of the seed laboratory
10. Date of the analysis

Seed labels must show:

1. Seed variety including botanical name and common name
2. Lot number or other lot identification
3. Origin
4. Net weight
5. Percent pure live seed
6. Percent total viability
7. Percent by weight inert matter
8. Percent by weight other crop seed
9. Percent by weight weed seed
10. Name of restricted noxious weed seed by number per pound of seed
11. Name and address of the supplier or grower
12. Date the seed was labeled

Add to section 21-2.01C:

04-15-22

21-2.01C(5) Fiber Reinforced Matrix

At least 7 days prior to purchase of fiber reinforced matrix submit:

1. Manufacturer information:
 - 1.1. Name
 - 1.2. Address
 - 1.3. Telephone number
 - 1.4. E-mail address
 - 1.5. Website
2. Product Label
3. Certification of compliance

After application of fiber reinforced matrix, submit a document that indicates:

1. Compliance with the specified application rates
2. Areas treated, and quantity of material applied
3. Application date and time

Replace section 21-2.01D(3) with:

10-18-19

21-2.01D(3) Seed

Seed must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Seed test must be performed for germination within 12 months before application.

Replace the 3rd paragraph of section 21-2.02B with:

04-16-21

Stockpile duff until work area to receive duff is complete. Duff stockpiles must not exceed 5 feet in height. Duff stockpiles must not be covered with a material that will stop air circulation, increase duff pile temperatures, or harm beneficial biological activity and resident seeds.

Replace item 1 in the list in the paragraph of section 21-2.02C with:

10-16-20

1. Consist of fertile, friable soil of loamy character with a pH range from 6 to 7 that contains organic matter in quantities natural to the region and capable of sustaining healthy plant life

Replace section 21-2.02I with:

04-15-22

21-2.02I Mycorrhizae Inoculant

Mycorrhizae inoculant must comply with section 20-3.01B(5).

Replace the 1st paragraph of section 21-2.02P with:

04-15-22

Fiber roll must be a premanufactured roll filled with rice or wheat straw, wood excelsior, cotton, or coconut fiber. Fiber roll must be covered with biodegradable jute, sisal, wood fiber, cotton, or coir fiber netting secured tightly at each end and must be one of the following:

1. 8 to 10 inches in diameter and at least 1.1 lb/ft
2. 10 to 12 inches in diameter and at least 3 lb/ft

Replace the 2nd paragraph of section 21-2.03J with:

04-19-19

Do not incorporate materials within 3 feet of the pavement edge.

04-19-19

Delete the 4th paragraph of section 21-2.03J

Replace section 21-2.03K with:

04-15-22

21-2.03K Fiber Reinforced Matrix

Apply fiber reinforced matrix with hydraulic spray equipment.

Add water to fiber reinforced matrix as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized.

Equipment must have a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and uniform application rate. The tank must have a minimum capacity of 1,000 gallons. You may use a smaller tank if authorized.

Apply fiber reinforced matrix in the locations and at the rates shown and as follows:

1. Apply in successive passes as necessary to achieve the specified application rate
2. Form a continuous uniform mat as follows:
 - 2.1. Apply in 2 or more directions if necessary
 - 2.2. Apply in layers as necessary to avoid slumping and aid drying
3. Start application within 60 minutes after adding seed to the tank

After final application, do not allow pedestrians or equipment on the treated areas.

Replace the 2nd paragraph in section 30-2.01C with:

10-15-21

The QC plan must include a pulverizing and paving plan outlining the sequence of work, including the maximum production rate for full depth recycling—no stabilizer activities.

Replace section 30-4 with:

10-15-21

30-4 FULL DEPTH RECYCLING—CEMENT

30-4.01 GENERAL

30-4.01A Summary

Section 30-4 includes specifications for constructing a recycled pavement base using FDR—cement.

Constructing an FDR—cement base includes:

1. Pulverizing existing asphalt concrete pavement and underlying materials
2. Mixing with water, cement, and if specified, supplementary aggregate
3. Grading and compacting the mixture
4. Applying asphaltic emulsion and sand cover

30-4.01B Definitions

Lot: 1,000 sq yd of FDR—cement

30-4.01C Submittals

30-4.01C(1) General

With the QC plan, submit the mix design.

Submit quality control test results along with the daily reports.

Submit QC test results to fdr@dot.ca.gov.

30-4.01C(2) Quality Assurance Submittals

30-4.01C(2)(a) General

Reserved

30-4.01C(2)(b) Mix Design

Submit each FDR—cement mix design at least 2 weeks before starting FDR—cement operations. Each mix design submittal must be sealed and signed by an engineer who is registered as a civil engineer in the State.

You may submit multiple mix designs to optimize the cement content and adjust for varying underlying materials.

Each mix design submittal must include:

1. Area represented by the mix design by beginning and ending stations.
2. Gradation of the mixture before addition of cement.
3. Cement content in percent by weight of the dry mixture and in lb/sq yd surface application rate.
4. Supplementary aggregate in percent by weight of the dry mixture, if supplementary aggregate is specified.
5. Moisture content of the material when mixing, relative to OMC.
6. Test results and any worksheets, photographs, and graphs.
7. Unconfined compressive strength test results.
8. Moisture-density curve of the material at the specified cement content.
9. Certificate of compliance for cement.

30-4.01C(2)(c) Quality Control Reporting

With the daily report, submit the following based on the testing frequencies specified:

1. General Information:
 - 1.1. Weather:
 - 1.1.1. Ambient air temperature before starting daily FDR—cement activities, including time of temperature reading.
 - 1.1.2. Road surface temperature before starting daily FDR—cement activities, including time of temperature reading.
2. Average forward speed of pulverizing equipment
3. FDR—cement quality control test results for unconfined compressive strength
4. Depth of pulverization

With the daily report, submit the test results for the quality characteristics within the times after sampling shown in the following table:

FDR—Cement Quality Characteristic Test Result Reporting Time Allowances

Quality characteristic	Maximum reporting time allowance
Water sulfates	Before work starts
Water chlorides	
Aggregate gradation	24 hours
Moisture content	
Laboratory maximum wet density	
Relative compaction	
Unconfined compressive strength	24 hours after testing specimens

30-4.01D Quality Assurance

30-4.01D(1) General

Relative compaction must be determined under California Test 231 and the following:

1. For a recycled layer 0.5-foot thick and less, perform 1 relative density test at mid layer. For thickness greater than 0.5-foot, test at every 0.5-foot intervals from 2 inches above the bottom of the FDR—cement layer.
2. A sample must contain no more than 5 percent retained on the 2-inch sieve and 15 percent retained on the 1-1/2-inch sieve.
3. Correction for oversize material does not apply.
4. Use the laboratory wet test maximum density closest in proximity to the lot to determine relative compaction. If the relative compaction for a lot is less than 95 percent in accordance with ASTM D1557 requirements, perform California Test 216 and California Test 226 for each noncompliant lot and recalculate the relative compaction.

The Engineer tests each test strip under section 30-4.01D(4).

30-4.01D(2) Mix Design

Develop a mix design for each materials sampling location. The mix design must produce FDR—cement with an unconfined compressive strength from 300 to 600 psi, determined at 7 days under ASTM D1633, Method A, with the exceptions shown in FDR—Cement Quality Characteristic Requirements table under section 30-4.02A.

Notify the Engineer at least 2 business days before sampling.

Use materials from the specified FDR—cement mixing depth. If any portion of existing asphalt concrete pavement is to be removed before pulverizing, remove that portion of asphalt concrete pavement from the samples used in the mix design. If additional samples of subgrade material are needed, sampling locations can be excavated outside the edge of pavement to variable dimensions. Characterize and record sampling location features such as layer thicknesses and types, distresses, interlayers, thin or thick areas, digouts, and adhesion to the base. Use the sampled material to determine the mix design represented by the sampling location, according to the proportions of the pavement structure shown.

Before opening the mix design sampling locations to traffic, backfill sampling locations by replacing and compacting with an authorized material or minor HMA that complies with section 39-2.07. Backfill and compact to the existing grade and thickness of asphalt concrete pavement, in the Engineer's presence.

30-4.01D(3) Quality Control

30-4.01D(3)(a) General

Reserved

30-4.01D(3)(b) Sampling, and Testing

Assign a ground supervisor whose sole purpose is to monitor the FDR—cement activities, advise project personnel, and interface with the quality control testing personnel. The ground supervisor must not have any sampling or testing duties.

Test the quality characteristics of FDR—cement shown in the following table:

FDR—Cement Quality Characteristic Sampling Locations and Testing Frequencies

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Aggregate gradation	California Test 202	Test strip and 1 per 2 lots	Loose mix after pulverizing and mixing
Moisture content	California Test 226	Test strip and 2 per day ^a	Loose mix after pulverizing and mixing ^b
Unconfined compressive strength	ASTM D1633	Test strip and 1 per 2 lots	
Laboratory maximum wet density	California Test 216	Test strip and 2 per day	Same location as California Test 231
Relative compaction ^c	California Test 231	Test strip and 1 per lot	Compacted mix

^aIf test fails, minimum test frequency is 1 per lot.

^bSample immediately after mixing is complete.

^cVerify the moisture content reading made under California Test 231 with California Test 226.

Measure and record the actual cut depth at both ends of the pulverizing drum at least once every 300 feet along the cut length. Take measurements in the Engineer's presence.

30-4.01D(4) Department Acceptance

The Department accepts FDR—cement based on:

1. Visual inspection for the following:
 - 1.1. No segregation, raveling, or loose material
 - 1.2. Variance must not be more than 0.05 foot measured from the lower edge of a 12-foot straightedge
 - 1.3. Uniform surface texture throughout the work limits
2. Compliance with the quality characteristics shown in the following table:

FDR—Cement Requirements for Acceptance

Quality characteristic	Test method	Value
Cement application rate (lb/sq yd)	Calibrated tray or equal	Mix design rate ± 5%
Relative compaction (min, %, wet density)	California Test 231	95

3. FDR—cement thickness for each lot. The thickness must be within 0.05 foot of the thickness shown. Verify the thickness at a location determined by, and in the presence of the engineer by one of the following methods:
 - 3.1. Excavate a test pit that is at least 1 by 1-foot and use phenolphthalein
 - 3.2. Survey equipment

30-4.02 MATERIALS

30-4.02A General

The quality characteristics for the FDR—cement must comply with the requirements shown in the following table:

FDR—Cement Quality Characteristic Requirements

Quality characteristic	Test method	Requirement
Aggregate gradation (% passing) ^a Sieve Size: 3 inch 2 inch 1-1/2 inch	California Test 202	100 95–100 85–100
Moisture content (%)	California Test 226	Mix design \pm 2 percent
Unconfined compressive strength (psi)	ASTM D1633 ^b	Specified in section 30-4.01D(2)
Laboratory maximum wet density (lb/cu ft)	California Test 216	Use for relative compaction calculation
Relative compaction (min, %, wet density) ^c	California Test 231	95

^aPerform aggregate gradation on samples collected from full recycled depth.

^bMethod A, except:

1. Test specimens must be compacted under ASTM D1557, Method A or B.
2. Test specimens must be cured by sealing each specimen with 2 layers of plastic at least 4-mil thick. The plastic must be tight around the specimen. Seal all seams with duct tape to prevent moisture loss. Sealed specimens must be placed in an oven for 7 days at 100 ± 5 degrees F. At the end of the cure period, specimens must be removed from the oven and air-cooled. Duct tape and plastic wrap must be removed before capping. Specimens must not be soaked before testing.

^cVerify the moisture content reading made under California Test 231 with California Test 226.

30-4.02B Cement

Reserved

30-4.02C Water

Reserved

30-4.02D Supplementary Aggregate

If supplementary aggregate is specified, supplementary aggregate must comply with the specifications for Class 2 aggregate base in section 26.

30-4.02E Asphaltic Emulsion

Asphaltic emulsion must be Grade SS-1h or CSS-1h.

Notify the Engineer if you dilute the asphaltic emulsion with water. The ratio by weight of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water weight.

30-4.02F Sand Cover

Sand used for sand cover must comply with the material specifications for fine aggregate under section 90-1.02C(3). Sand must not contain more than 2 percent moisture by dry weight of sand.

30-4.02G Test Pit Backfill Material

Backfill for test pits must be FDR—cement treated material.

30-4.03 CONSTRUCTION

30-4.03A General

Do not start FDR—cement activities if the ambient air temperature is below 40 degrees F or the road surface is below 40 degrees F. If the ambient air temperature falls below 40 degrees F during FDR—cement activities, you may only compact and finish FDR—cement.

Backfill test pits and compact to 95 percent under California Test 231. After compaction, the repair area must not vary more than 0.05 foot from the adjacent FDR—cement surface.

30-4.03B Equipment

The FDR—cement mixing machine must have independent and interlocked systems for water and must include the following:

1. Digital electronic controller system
2. Pumping system
3. Spray bar system

The cement distributor must have a vacuum or dust suppressant system to minimize airborne cement during spreading of the cement on the grade.

Storage equipment for water must not leak and must be attached to the FDR—cement mixing machine with a tow bar and hose. The hose must be attached to the bar and must not touch the ground at any time.

Grading and compacting equipment must be self-propelled and reversible. The frequency and amplitude of vibrating rollers must be adjustable and exceed a force of 15 tons in vibratory mode.

30-4.03C Pulverizing

Unless otherwise authorized, do not pulverize more material than can be mixed with cement and compacted in one day.

Do not leave a wedge where the pulverizing drum cuts into the existing material. The 1st cut width must use the full width of the pulverizing drum. Subsequent cuts must overlap at least 4 inches. Do not leave a gap of unpulverized material between cuts. If an overlap is less than 4 inches, immediately back up and pulverize the deviation along the correct cut line.

Mark the existing pavement where the center of the pulverizing drum stops. Start the following cut on this alignment at least 2 feet behind the mark.

30-4.03D Spreading Materials

Spread cement uniformly over the full roadway surface width. Do not spread cement more than 30 minutes before mixing. Do not apply dry cement in windy conditions that will result in dust outside the FDR—cement area. The spread rate must be the mix design rate or the ordered rate in lb/sq yd \pm 5 percent.

Do not spread cement and supplementary aggregate before pulverizing.

30-4.03E Mixing

The overlap requirements in section 30-4.03C apply to mixing. With each cut, adjust the quantity of water proportionally to the actual cut width. If an overlap is less than 4 inches, immediately back up and pulverize the deviation along the correct line without adding water or cement.

Water must be injected through the mixing machine. The injection rate of mixing water must be sufficient to produce the FDR—cement material mixing moisture content described in the mix design.

Mark where the center of the pulverizing drum stops. Start the following cut on this alignment at least 2 feet behind the mark.

30-4.03F Compacting and Grading

Immediately after pulverizing and mixing, compact FDR—cement to the minimum relative compaction. Do not allow more than 2 hours between final mixing of the pulverized material with cement and completion

36-3.01B Definitions

Area of Localized Roughness: Continuous moving average of the 25-foot International Roughness Index values for each wheel path using a 25-foot continuous interval and a 250-mm filter.

Mean Roughness Index: 0.1-mile International Roughness Index values for the left and right wheel paths for the same traffic lane using a 250-mm filter.

Profile Viewer and Analyzer: An engineering software application that allows users to view and analyze pavement profiles.

wheel paths: Pair of parallel lines 3 feet left and right of the center of a traffic lane. Left and right wheel paths are based on the direction of travel.

36-3.01C Submittals

36-3.01C(1) General

Reserved

36-3.01C(2) Inertial Profiler Data

At least 15 days before measuring pavement smoothness with an inertial profiler, register with the Department's secure file sharing system. To obtain information on the registration process, send an e-mail with your contact information to asphalt.smoothness@dot.ca.gov for asphalt and concrete.smoothness@dot.ca.gov for concrete surfaces.

Within 12 hours or on the same day of completing smoothness measurement, submit electronic copy of the raw profile data as a PPF file on an authorized data storage device, along with a coordinated video or images taken at intervals no greater than 52.8 feet for the existing and baseline profiles. Also, submit a hard copy or a PDF file listing the following:

1. Profile data collection time and date
2. Data collection software version used
3. Sensor serial number
4. Low- and high-pass filter used
5. 0.1-mile MRI values

Within 2 business days after each day of profiling, submit the profile information to the Engineer and to the Department's secure file sharing system. After submitting the profile information to the Department's file sharing system, send a notification of your electronic submittal to the Engineer and to the applicable e-mail address above with the names of the files submitted.

For each surface subject to inertial profile smoothness requirements, the profile data information must include:

1. Raw profile data for each lane.
2. ProVAL ride quality analysis report for the MRI of each lane in a PDF file. Report the following:
 - 2.1. Listing of MRI values for 0.1-mile segments or portions thereof
 - 2.2. Input data including the specified MRI threshold and fixed segment length
 - 2.3. Raw profile data name selections
 - 2.4. Areas exempt from inertial profile smoothness requirements
3. ProVAL ride quality analysis report for the IRI of the left and right wheel paths of each lane in a PDF file. Report the following:
 - 3.1. Listing of ALR
 - 3.2. Input data including the specified area of the localized roughness threshold and continuous segment length
 - 3.3. Raw profile data name selections
 - 3.4. Areas exempt from inertial profile smoothness
4. GPS data file for each lane. Submit the data file in GPS eXchange file format.
5. Manufacturer's recommended calibration and verification test results for the inertial profiler.
6. Inertial profiler's calibration and verification test results, including results for bounce, block, and the distance measurement instrument.
7. Completed Pavement Smoothness Inertial Profiler Submittal Record form.

Submit Asphalt Concrete Pavement Smoothness Corrections Information form or Concrete Pavement Smoothness Corrections Information form with your final profile data information submittal.

Submit the raw profile data in an unfiltered PPF file. Use the following file naming convention:

YYYYMMDD_TTCCRRR_EA_D_L_W_B_E_X_PT.EXT

where:

YYYY = year

MM = month, leading zero

DD = day of the month, leading zero

TT = district, leading zero

CCC = county, 2- or 3-letter abbreviation as shown in section 1-1.08

RRR = route number with no leading zeros

EA = Contract number, excluding the district identification number, expressed as 6 characters

D = traffic direction, *NB*, *SB*, *WB*, or *EB*

L = lane number from left to right in the direction of travel

W = wheel path, *L* for left, *R* for right, or *B* for both

B = beginning station to the nearest foot, such as *10+20*, or beginning postmile to the nearest hundredth, such as *25.06* with no leading zero.

E = ending station to the nearest foot, such as *14+20*, or ending postmile to the nearest hundredth, such as *28.06* with no leading zero.

X = profile operation, *EXIST* for existing pavement, *BASELINE* for existing pavement after performing repairs, *PAVE* for after paving, and *FINAL* for completed pavement documentation of compliance.

PT = project type profiled, such as *Type A HMA*, *RHMA-G*, *OGFC*, *JPCP*, *CRCP*, or *Grind*

EXT = *PPF* for raw profile data file extension.

If you are submitting multiple inertial profiler data files, compress the files into a .ZIP file format and submit them using the file-naming convention *TT_EA_X_YYYYMMDD.zip*.

36-3.01C(3) Smoothness Corrective Grinding Plan

At least 2 business days before performing corrective grinding for areas that do not meet the smoothness requirements, submit a corrective grinding plan as an informational submittal.

The corrective grinding plan must include:

1. Grinder make and model
2. Grinder wheelbase in feet, measured from the front centerline to the back centerline of the single wheel or tandem wheel spread
3. Grinder head position in feet, measured relative to the centerline of the front single wheel or the front tandem wheel spread
4. Tandem wheel spreads in feet
5. Tabular listing of the planned corrective grinding, including:
 - 5.1. Begin and end locations in stationing to the nearest foot
 - 5.2. Width of grind, such as left half lane, right half lane, or full-width lane
 - 5.3. Corresponding grinder head depths to the nearest 0.01 inch
 - 5.4. Direction of grind such as forward, reverse, forward-forward, reverse-reverse, forward-reverse, reverse-forward
6. Forecasted improvement in terms of the MRI and ALR values

36-3.01C(4) Straightedge Measurements

Within 2 business days of measuring smoothness with a straightedge, submit a list of the areas requiring smoothness correction or a report stating there are no areas requiring smoothness correction. Identify the areas requiring smoothness correction by:

1. Location number
2. District-County-Route
3. Beginning station or postmile to the nearest 0.01 mile
4. For correction areas within a traffic lane:

- 4.1. Lane direction, *NB*, *SB*, *EB*, or *WB*
- 4.2. Lane number from left to right in the direction of travel
- 4.3. Wheel path, *L* for left, *R* for right, or *B* for both
5. For correction areas not within a traffic lane:
 - 5.1. Identify the pavement area, such as shoulder, weigh station, or turnout
 - 5.2. Direction and distance from the centerline, *L* for left or *R* for right
6. Estimated size of correction area

36-3.01C(5) Smoothness Quality Control Plan

Submit a written smoothness quality control plan to the Engineer at or before preconstruction meeting, except the layout plan. Submit the layout plan as an addendum to the smoothness quality control plan no later than 3 days after the *EXIST* profile is collected. The plan must include:

1. Organization: Contact names, organizational chart, telephone numbers, current certifications and titles, and roles and responsibilities of personnel for monitoring smoothness, collecting profile data, submitting data, pay adjustment requests and reports, and implementing corrective actions.
2. Inertial profiler certification:
 - 2.1. Inertial profiler certification issued by the Department
 - 2.2. Operator certification for the inertial profiler issued by the Department
 - 2.3. Manufacturer's instructions and test procedures for calibration and verification of the inertial profiler
3. Schedule: The methods and timing used for monitoring or testing ride quality or both throughout the placement operation process. Indicate the approximate timing of acceptance testing for the profile operations defined in section 36-3.01C(6)(b) in relation to placement operations.
4. Layout plan:
 - 4.1. Establish semipermanent reference points at the beginning and end of the project based on the plans. For each profile run, define additional semipermanent reference points for the begin and end position of each run. Show the position and name of each semipermanent reference point. These reference points must be located outside of the traveled way, perpendicular to the beginning position of each lane. Where beginning positions are adjacent to each other but staggered, use separate beginning positions. Semipermanent reference points used to establish the beginning position of a profile run must be labeled in the field and in the pavement profiles using the following naming convention:

XXX-D-L-STA-VAL

where:

XXX = *Beg* for the beginning of each profile run, *End* for the end of each profile run, *ExB* for the beginning point of the areas excluded from inertial profiler testing and *ExE* for the end point of the areas excluded from inertial profiler testing.

D = traffic direction, *NB*, *SB*, *WB*, or *EB*.

L = lane number from left to right in the direction of travel, such as 1, 2, or 3.

STA = station to the nearest foot, such as 10+20. Do not use postmiles.

VAL = use *INC* where the value of stationing in the PPF file will increase in the direction of travel. Use *DEC* where the absolute value of the stationing in the PPF file will decrease in the direction of travel.

Use the same label name regardless of the stage of the profile.

- 4.2. For each semipermanent reference point, include a KMZ file with:
 - 4.2.1. Color photographs clearly displaying the physical label used to define the semipermanent reference points.
 - 4.2.2. Listing of GPS coordinates.

Semipermanent reference points, wherever possible, must be recorded by inertial profilers using electronic eye readings of reflectors.

36-3.01C(6) Smoothness Payment Adjustment Request

36-3.01C(6)(a) General

Smoothness payment adjustment request must include a ProVAL project file and a payment adjustment spreadsheet for each lane.

36-3.01C(6)(b) ProVAL Project File

After completing final corrections, submit an electronic ProVAL project file for each lane using the same naming convention listed in section 36-3.01C(2), except:

1. *B* = use the common beginning station found in all profiles included in the ProVAL project file followed by the postmile to the nearest tenth of a mile, such as *675+84 (12.83)* for station 675+84 and post mile 12.83.
2. *E* = use the ending station found in the *FINAL* profile followed by the postmile to the nearest tenth of a mile.
3. *X* = *PAYADJ*.
4. *EXT* = *PVP* for ProVAL project file extension.

Use a single ProVAL project file for each lane. Each ProVAL project file must contain the PPF files from the profile operation shown in the following table:

Profiles Needed by Smoothness Table

Profile	HMA pavement constructed on existing pavements	New HMA pavement alignment or new realignments	Concrete pavement target 60/67.5/75	Grind concrete pavement percent improvement
EXIST	X	--	--	X
BASELINE	X	--	--	X
PAVE	X	X	X	--
FINAL	X	X	X	X

Establish and maintain stationing to allow for direct comparison of smoothness data between you and the Engineer in subsequent tests. The profiles must:

1. Align with each other in ProVAL.
2. Use the same beginning station position in all profile files and in a single ProVAL project file.
3. Use the same semipermanent reference points for the beginning and ending positions of each profile required by section 36-3.01C(5).
4. For alignment purposes, the end station determined from the profiles distance measuring instrumentation of each sequentially numbered 0.1-mile segment or portion thereof in the *BASELINE*, *PAVE* and *FINAL* profiles must be no greater than 20 feet in the first mile when compared to the same sequentially numbered segment end station in the *EXIST* profile. For locations more than 1 mile but less than 2.5 miles, the difference must be prorated from 20 feet to 50 feet. For locations more than 2.5 miles from the beginning position of the profile, the difference must be no greater than 50 feet. Where these differences create an additional sequentially numbered segment and when needed to bring the sequentially numbered segments back into alignment, the event defining the ending position of the partial segment in the PPF file of the *BASELINE*, *PAVE* and *FINAL* profiles may be adjusted no more than 20 feet within the first 2.5 miles, and no more than 50 feet at all other locations. Include the same leave-out sections referenced to the same semipermanent reference points.

36-3.01C(6)(c) Payment Adjustment Spreadsheet

For each lane, submit payment adjustment spreadsheet using the Department-furnished worksheet. Data must be exported directly from the ProVAL project file Ride Quality module into the corresponding worksheet using the following settings:

1. Analysis Type set to *Fixed Interval*
2. Ride Quality Index set to *MRI*

3. Threshold using numeric value
4. Segment Length in feet set to 528.00

Obtain the worksheet from the following site:

<https://dot.ca.gov/programs/construction/pavement-smoothness>

When sequentially numbered segments are misaligned and adjustments are required as described in section 36-3.01C(6)(b), make the adjustments within the ProVAL project file before exporting data to a worksheet and notify the Engineer.

36-3.01C(7) Inertial Profiler Verification Test

Within 2 business days after the annual cross-correlation testing, submit a ProVAL profiler certification analysis report for the test results to the Engineer and to the e-mail address:

smoothness@dot.ca.gov

36-3.01D Quality Assurance

36-3.01D(1) General

Reserved

36-3.01D(2) Certifications

The inertial profiler must display a current certification decal showing the expiration date.

The operator must be certified for each model of inertial profiler operated.

The certifications issued by the Department for the inertial profiler and operator must be current.

36-3.01D(3) Quality Control

36-3.01D(3)(a) General

Reserved

36-3.01D(3)(b) Smoothness Measurement

36-3.01D(3)(b)(i) General

Measure pavement smoothness using an inertial profiler.

The following areas are excluded from MRI smoothness requirements but are subject to ALR:

1. Continuous pavement less than 1,000 feet in length
2. Ramps
3. Turn lanes
4. Acceleration and deceleration lanes

The following areas are excluded from smoothness measurement with an inertial profiler but are subject to the 12-foot straightedge measurement:

1. Areas within 15 feet of manholes, weigh-in-motion, railroad crossing, cattle guards, bus pad, and transverse gutter pans
2. Sections of traffic lane immediately adjacent to edge of traveled way where the distance between edge of traveled way and the longitudinal gutter pan is less than or equal to 8 feet
3. Areas within 25 feet of the beginning and 25 feet beyond the end of the intersection radius
4. Areas within 25 feet of the roundabout radius
5. Shoulders
6. Miscellaneous areas such as medians, gore areas, turnouts, and maintenance pullouts
7. Areas within 15 feet of the beginning of an approach slab or bridge, and 40 feet beyond the end of a departure slab or bridge
8. Horizontal curves with a radius less than the following and within the superelevation transition of such curves:
 - 8.1. 150 feet for asphalt pavements
 - 8.2. 300 feet for concrete pavements

9. Pavement length less than 25 feet
10. Areas of HMA with a single opportunity within 20 feet of locations where localized roughness exceeds 160 inches per mile on the *BASELINE* profile after filtering the profile with the ProVAL Moving Average Low Pass filter with a 30-foot short cutoff wavelength
11. HMA placed under concrete pavement

Where measurement with inertial profiler is required:

1. Determine the pavement smoothness by obtaining the IRI for the left and right wheel paths on each traffic lane.
2. Determine the MRI and ALR using ProVAL.

Where OGFC is required, test the pavement smoothness of the final asphalt or concrete pavement surface before and after placing OGFC.

36-3.01D(3)(b)(ii) Inertial Profiler Calibration and Verification Tests

Notify the Engineer at least 2 business days before performing calibration and verification testing of the inertial profiler.

Conduct the following calibration and verification tests in the Engineer's presence each day before profiling:

1. Block test to verify the accuracy of the height sensor under California Test 387
2. Bounce test to verify the combined accuracy of the height sensor and accelerometer under California Test 387
3. Distance measurement instrument test to verify the accuracy of the distance measuring instrument under California Test 387
4. Manufacturer's recommended tests

Conduct a cross-correlation verification test of the inertial profiler in the Engineer's presence before performing the initial profiling. A verification test must be performed at least annually. Conduct 5 repeated runs of the inertial profiler on an authorized 0.1-mile test section. Calculate a cross-correlation to determine the repeatability of your device under California Test 387 using a ProVAL profiler certification analysis with a 3-foot maximum offset. The cross-correlation must be a minimum of 0.92.

36-3.01D(3)(b)(iii) Collecting and Analyzing Data

Operate the inertial profiler under the manufacturer's instructions. Collect profiling data under AASHTO R 57 at 1-inch recording intervals using a minimum 4-inch line laser sensor and analyze IRI using a 250-mm filter.

Establish semipermanent reference points for aligning inertial profiler runs and locating potential corrective grinding. Maintain semipermanent reference points until Department acceptance testing is completed.

While collecting the profile data to determine the IRI values, record semipermanent reference points at the beginning and end of the profile run and the beginning and end of the following locations in the raw profile data:

1. Bridge approach slabs
2. Bridges
3. Culverts visible on the roadway surface
4. Railroad crossings
5. At-grade intersections
6. Project limits
7. Change in pavement type

Profile the left and right wheel paths of each lane. Determine the MRI for 0.1-mile fixed segments using the ProVAL ride quality analysis with a 250-mm filter. Calculate the MRI of each lane. Segments less than 0.05 mile will not be evaluated for MRI but must comply with ALR requirement. Segments greater than or equal to 0.05 mile and less than or equal to 0.10 mile must comply with the MRI specifications for a 0.1-mile segment. Pay adjustments for segments greater than or equal to 0.05 mile and less than or equal to

0.10 mile will be calculated based on a prorated length. Determine the ALR using ProVAL with the average IRI values for each wheel path using a 25-foot continuous interval and a 250-mm filter.

36-3.01D(4) Department Acceptance

36-3.01D(4)(a) General

The Department accepts pavement surfaces for smoothness based on compliance with the smoothness specifications for the type of pavement surface specified.

For areas that require pavement smoothness determined using a 12-foot straightedge, the pavement surface must not vary from the lower edge of the straightedge by more than:

1. 0.01 foot when the straightedge is laid parallel with the traffic lane centerline
2. 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
3. 0.02 foot when the straightedge is laid within 24 feet of a pavement conform

36-3.01D(4)(b) Profile Verification

The Engineer may perform verification testing using the Department's inertial profiler. The Engineer notifies you of the Department's intention to perform verification testing. Your acceptance test results are considered acceptable and will be used for incentive and disincentive payments if your mean MRI is within 10 percent of the Department's mean MRI obtained over the same selected project length. When your test results are not considered acceptable, the Department's MRI values will be used in the calculation for incentive and disincentive payments for that evaluated length and the Department will have 15 days to complete an evaluation of both profiler certifications.

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer within 5 business days of receiving the verification test result if you will dispute it. An independent third party will perform referee testing over the same selected project length. Before the third party participates in a dispute resolution, their profiler and operator must be certified under the Department's Profiler Certification Program. The independent third party must have no prior direct involvement with this Contract or no current direct involvement with you. The mean MRI value used in the calculation for incentive and disincentive payments will be from the party whose mean MRI value is closer to the independent third party and the other party pays for the independent third party's testing.

36-3.02 MATERIALS

Not Used

36-3.03 CONSTRUCTION

Notify the Engineer of the beginning location by station and start time at least 2 business days before each day of profiling.

Before profiling, remove foreign objects from the pavement surface and mark the begin and end station on the pavement shoulder. The stationing must be the same when profiling more than 1 surface.

36-3.04 PAYMENT

Not Used

37 BITUMINOUS SEALS

04-15-22

Replace the 2nd paragraph of section 37-1.01C with:

04-15-22

At least 10 days before starting bituminous seal activities, submit the names and certifications for the laboratories performing testing.

Replace the 2nd paragraph of section 37-1.01D(1) with:

04-15-22

For emulsion testing, quality control laboratories must be AASHTO resource accredited for asphalt emulsions and asphalt binders.

Add to section 37-1.01D(1):

10-16-20

Take samples under California Test 125.

Replace item 1 in the list in the 1st paragraph of section 37-2.01A(3) with:

10-16-20

1. Samples for:
 - 1.1. Asphaltic emulsion chip seal, two 1-quart samples of asphaltic emulsion
 - 1.2. Polymer modified asphaltic emulsion chip seal, two 1-quart samples of polymer modified asphaltic emulsion
 - 1.3. Asphalt rubber binder chip seal, two 1-quart samples of base asphalt binder
 - 1.4. Asphalt rubber binder chip seal, five 1-quart samples of asphalt rubber binder

Replace the last paragraph of section 37-2.01A(3) with:

04-15-22

Within 3 days after taking asphaltic emulsion or asphalt binder quality control samples, submit the quality control laboratory's test results.

Replace 2 per day in the row for *Gradation (% passing)* in the table in the 2nd paragraph of section 37-2.01A(4)(b)(ii) with:

04-15-22

1 per day per active stockpile

Replace 2 per day in the row for *Cleanliness value (min)* in the table in the 2nd paragraph of section 37-2.01A(4)(b)(ii) with:

04-15-22

1 per day per active stockpile

Replace section 37-2.01A(4)(b)(iii) with:

04-15-22

37-2.01A(4)(b)(iii) Chip Seals

For a chip seal, perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristic shown in the following table:

Chip Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Binder application rate (gal/sq yd)	ASTM D2995 ^a	1 per week per distributor truck and before chip seal production starts	Pavement surface

^aUse a durable pad appropriate for the type of binder being sprayed.

Replace the 8th paragraph of section 37-2.01A(4)(c) with:

04-15-22

If the test results for the aggregate gradation do not comply with specifications, you may remove the chip seal represented by these tests or propose a corrective action plan to remain in place. Do not start chip seal activities until the corrective action plan is authorized. If you choose not to remove the chip seal, submit a request that it remain in place with a payment deduction.

Replace the introductory clause in the 3rd paragraph of section 37-2.01B(3)(a) with:

04-15-22

The laboratory must conduct the Vialit test using the proposed asphaltic emulsion or asphalt binder and aggregate for compliance with the requirements shown in the following table:

Add after the 3rd paragraph of section 37-2.01B(3)(a):

04-15-22

Vialit Test method can be requested by sending email to: Vialit Test@dot.ca.gov.

Replace the 3rd paragraph of section 37-2.01C(4)(b) with:

04-15-22

For asphaltic emulsion or asphalt binder, overlap longitudinal joints by not more than 4 inches.

Replace the 1st paragraph of section 37-2.01C(4)(c)(i) with:

04-15-22

Do not allow vehicles to drive on asphaltic emulsion or asphalt binder before spreading aggregate.

Replace the heading of section 37-2.02 with:

04-15-22

37-2.02 CATIONIC ASPHALTIC EMULSION CHIP SEALS

Replace section 37-2.02A(3) with:

04-15-22

37-2.02A(3) Submittals

Reserved

Replace the heading of section 37-2.02A(4)(b)(ii) with:

04-15-22

37-2.02A(4)(b)(ii) Cationic Asphaltic Emulsions

Replace the 1st paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

In the presence of the Engineer, take two 1-quart samples at the specified frequency and location under CT 125.

Replace the introductory clause in the 2nd paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title of the table in the 2nd paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

Rapid-Setting Cationic Asphaltic Emulsion

Delete footnote a and the superscript a in the table in the 2nd paragraph of section 37-2.02A(4)(b)(ii).

04-15-22

Replace section 37-2.02B(2) with:

04-15-22

37-2.02B(2) Cationic Asphaltic Emulsions

Asphaltic emulsion must be either Grade CRS-2 or CRS-2h.

Replace the heading of section 37-2.02C(2) with:

04-15-22

37-2.02C(2) Cationic Asphaltic Emulsions

Add to the end of section 37-2.02C(2):

04-15-22

If high winds blow debris on roadway or cause spreading issues for binder, cease operations.

Replace the heading of section 37-2.03 with:

04-15-22

37-2.03 CATIONIC POLYMER MODIFIED ASPHALTIC EMULSION CHIP SEALS

Replace section 37-2.03A(3) with:

04-15-22

37-2.03A(3) Submittals

Immediately after sampling, submit two 1-quart samples of polymer modified asphaltic emulsion taken in the presence of the Engineer.

Replace section 37-2.03A(4)(b)(ii) with:

04-15-22

37-2.03A(4)(b)(ii) Cationic Polymer Modified Asphaltic Emulsions

Take two 1-quart samples at the specified frequency and location under CT 125 in the presence of the Engineer.

Quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following tables:

Rapid-Setting Cationic Polymer Modified Asphaltic Emulsion (If using PMCRS or PMCRS-2h)

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Storage stability test, 1 day (max, %)			
Sieve test (max, %)			
Demulsibility (min, %)			
Particle charge			
Residue by distillation or evaporation (min, %)	AASHTO T 59 ^a		
Tests on residue from evaporation test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Penetration, 4 °C, 200g for 60 seconds	AASHTO T 49		
Ductility, 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %) Or Elastic recovery, 25 °C (min, %)	California Test 332 AASHTO T 301		
Ring and Ball Softening Point (min, °F)	AASHTO T 53		

^aFollow the temperature guidelines under section 94-1.02F.

Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsion Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Storage stability test, 1 day (max, %)			
Sieve (max, %)			
Oil distillate (max, %)			
Particle charge			
Demulsibility (min, %)			
Residue from distillation or evaporation test (min, %)			
pH	ASTM E70		
Tests on residue:			
Viscosity, at 60 °C, (Pa-s) (max)	AASHTO T 202	Minimum 1 per day per delivery truck	Distributor truck
Penetration, 4 °C, (dmm)	AASHTO T 49		
Elastic recovery, 25 °C (min, %)	AASHTO T 301		

Replace the 2nd paragraph of section 37-2.03B(2) with:

04-15-22

A polymer modified asphaltic emulsion must be either Grade PMCRS-2, PMCRS-2h, or PMRE.

Delete the 3rd paragraph of section 37-2.03B(2):

04-15-22

Replace the 1st paragraph of section 37-2.04A(4)(b)(iv) with:

04-15-22

For asphalt rubber binders, you must perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristics shown in the following tables:

Asphalt Rubber Binder Quality Control Requirements (Viscosity)

Quality characteristic	Test method	Sampling location	Frequency
Descending viscosity ^a	ASTM D7741/D7741 M	Reaction vessel	1 per lot ^b
Viscosity	ASTM D7741/7741M	Distribution truck	15 minutes before use per lot ^b

^aStart taking viscosity readings at least 45 minutes after adding crumb rubber modifier and continue taking viscosity readings every 30 minutes until 2 consecutive descending viscosity readings have been obtained and the final viscosity complies with the specification requirement.

^bA lot is defined in the *MPQP*. Test results to be performed and submitted for acceptance.

Asphalt Rubber Binder Quality Control Requirements

Quality characteristic	Test method	Sampling location	Frequency
Cone penetration at 25 °C (0.10 mm)	ASTM D217	Distribution truck	1 per lot ^a
Resilience at 25 °C (% rebound)	ASTM D5329		
Softening point (°C)	ASTM D36/D36M		

^aA lot is defined in the *MPQP*. Laboratory test results to be performed and submitted for acceptance.

Replace the 1st paragraph of section 37-2.04A(4)(c)(iv) with:

10-16-20

For Department acceptance testing, take two 1-quart samples and one 1-gallon sample of asphalt rubber binder in the presence of the Engineer for every 5 lots or once a day, whichever is greater.

Replace the table in the 2nd paragraph of section 37-2.04A(4)(c)(iv) with:

04-15-22

Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–70
Resilience at 25 °C (min, % rebound)	ASTM D5329	18
Softening point (°C)	ASTM D36/D36M	52–74
Viscosity at 190 °C (centipoises) ^a	ASTM D7741/D7741M	1,500–4,000

^aPrepare sample for viscosity test under California Test 388.

Replace item 1 in the list in the 1st paragraph of section 37-3.01A(3) with:

10-16-20

1. Samples for:
 - 1.1. Asphaltic emulsion slurry seal, two 1-quart samples of asphaltic emulsion
 - 1.2. Polymer modified asphaltic emulsion slurry seal, two 1-quart samples of polymer modified asphaltic emulsion
 - 1.3. Micro-surfacing, two 1-quart samples of micro-surfacing emulsion

Replace the 2nd paragraph of section 37-3.01A(3) with:

04-15-22

At least 10 days before starting placement of a slurry seal or micro-surfacing, submit a laboratory report of test results and the proposed mix design from an AASHTO re:source accredited laboratory for asphalt emulsions and pavement preservation. The laboratory must sign the laboratory report and mix design.

Replace the table in the 7th paragraph of section 37-3.01A(3) with:

04-15-22

Quality Control Test Reporting Requirements

Quality characteristic	Maximum reporting time allowance
Los Angeles Rattler loss (max, %)	2 business days
Percent of crushed particles (min, %)	2 business days
Durability (min)	2 business days
Gradation (% passing by weight)	48 hours
Sand equivalent (min)	48 hours
Moisture content (%)	48 hours

Replace section 37-3.01A(4)(b)(i) with:

04-15-22

37-3.01A(4)(b)(i) General

For mix designs, quality control laboratories must be AASHTO re:source accredited for pavement preservation.

Replace the table of section 37-3.01A(4)(b)(ii) with:

04-15-22

Aggregate Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211	1st day of production	See California Test 125
Percent of crushed particles (min, %)	AASHTO T 335	1st day of production	See California Test 125
Sand equivalent (min)	California Test 217	1 per working stockpile per day	See California Test 125
Durability (min)	California Test 229	1st day of production	See California Test 125
Gradation (% passing by weight)	California Test 202	1 per working stockpile per day	See California Test 125
Moisture content, from field stockpile (%)	AASHTO T 255 ^a	1 per working stockpile per day	See California Test 125

^aTest aggregate moisture at field stockpile every 2 hours if you are unable to maintain the moisture content to within a maximum daily variation of ±0.5 percent.

Replace section 37-3.02A(3) with:

10-16-20

37-3.02A(3) Submittals

Immediately after sampling, submit two 1-quart samples of asphaltic emulsion or polymer modified asphaltic emulsion taken in the presence of the Engineer.

Replace section 37-3.02A(4)(b)(i) with:

10-16-20

37-3.02A(4)(b)(i) General

Take two 1-quart samples of asphaltic emulsion and polymer modified asphaltic emulsion for Department acceptance testing.

Replace the introductory clause in the 1st paragraph of section 37-3.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title in the table of section 37-3.02A(4)(b)(ii) with:

04-15-22

Quick-Setting Asphaltic Emulsion

Replace section 37-3.02A(4)(b)(iii) with:

04-15-22

37-3.02A(4)(b)(iii) Polymer Modified Asphaltic Emulsion

For polymer modified asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Quick-Setting Polymer Modified Cationic Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling Location
Tests on emulsion:			
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Sieve test (%)	AASHTO T 59		
Storage stability after 1 day (%)	AASHTO T 59		
Residue by evaporation (min, %)	AASHTO T 59 ^a		
Particle charge	AASHTO T 59		
Tests on residue by evaporation:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Ductility at 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %) Or	California Test 332		
Elastic recovery, 25 °C (min, %)	AASHTO T 301		

^aFollow the temperature guidelines under section 94-1.02F.

Replace section 37-3.02B(2) with:

04-15-22

37-3.02B(2) Asphaltic Emulsions

The asphaltic emulsion must be Grade CQS-1h.

Replace section 37-3.02B(3) with:

04-17-20

37-3.02B(3) Polymer Modified Asphaltic Emulsions

A polymer modified asphaltic emulsion must be grade PMCQS-1h.

A polymer modified asphaltic emulsion must consist of an elastomeric polymer mixed with an asphaltic material uniformly emulsified with water and an emulsifying or stabilization agent.

A polymer modified asphaltic emulsion must use either neoprene polymer or butadiene and styrene copolymer. The polymer must be homogeneous and milled into the asphaltic emulsion at the colloid mill.

Replace section 37-3.03A(3) with:

10-16-20

37-3.03A(3) Submittals

Immediately after sampling, submit two 1-quart samples of micro-surfacing emulsion taken in the presence of the Engineer.

Replace section 37-3.03A(4)(b)(ii) with:

04-15-22

37-3.03A(4)(b)(ii) Micro-surfacing Emulsions

Take two 1-quart samples of micro-surfacing emulsion for Department acceptance testing.

For a micro-surfacing emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Micro-Surfacing Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Tests on emulsion:			
Saybolt Furol Viscosity, at 25°C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Storage stability, 1 day (max, %)			
Sieve test (max, %)			
Residue by distillation or evaporation (min, %)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Tests on residue:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Softening point (min, °C)	AASHTO T 53		
Torsional recovery (min, %)	California Test 332		
or Elastic recovery, 25 °C (min, %)	AASHTO T 301		

Replace section 37-3.03B(2) with:

04-17-20

37-3.03B(2) Micro-surfacing Emulsions

A micro-surfacing emulsion must be grade MSE.

A micro-surfacing emulsion must be a homogeneous mixture of asphalt, an elastomeric polymer, and an emulsifier solution.

04-15-22

Add an elastomeric polymer modifier to asphalt or emulsifier solution before emulsification.

Replace item 1 in the paragraph of section 37-4.01A(3) with:

10-16-20

1. Two 1-quart samples of asphaltic emulsion

Add to section 37-4.01A:

10-16-20

37-4.01A(4) Quality Assurance

Reserved

Replace section 37-4.02A(3) with:

10-16-20

37-4.02A(3) Submittals

Immediately after sampling, submit two 1-quart samples of asphaltic emulsion taken in the presence of the Engineer.

Replace the 1st paragraph of section 37-4.02A(4)(b)(ii) with:

10-16-20

Take two 1-quart samples for Department acceptance testing.

Replace the introductory clause in the 2nd paragraph of section 37-4.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title in the table of section 37-4.02A(4)(b)(ii) with:

04-15-22

Quick-Setting Asphaltic Emulsion

Replace section 37-4.02A(4)(b)(iii) with:

04-15-22

37-4.02A(4)(b)(iii) Asphaltic Emulsion Spread Rates

For fog seals, perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristic shown in the following table:

Fog Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Asphaltic emulsion spread rate (gal/sq yd)	ASTM D2995	First day of production	Pavement surface

Replace item 3 in the list in the paragraph of section 37-4.02A(4)(c) with:

04-15-22

- The Department's determination of residual asphalt

Replace the 1st and 2nd paragraphs of section 37-4.02C with:

04-15-22

Immediately before applying fog seal, clean surface to receive fog seal by removing any extraneous material affecting adhesion of the fog seal with the existing surface. Use self-propelled brooms to clean the existing pavement.

Dilution and application rates are dependent on the surface conditions. You determine the dilution rate, but it must not be more than 50 percent water or 1:1 ratio and diluted emulsion must be applied with a residual asphalt rate from 0.02 to 0.06 gal/sq yd.

Replace items 1 and 2 in the list in the 2nd paragraph of section 37-5.01C with:

04-15-22

- Name of the quality control laboratory to perform testing and mix design.
- Laboratory report of test results and a proposed mix design. The report and mix design must include the specific materials to be used and show a comparison of test results and specifications. The mix design report must include the quantity of water allowed to be added at the job site. The quality control laboratory performing the tests must sign the original laboratory report and mix design.

Replace the 6th paragraph of section 37-5.01C with:

10-16-20

Immediately after sampling, submit two 1-quart samples of parking area seal taken in the presence of the Engineer.

Replace the introductory clause in the 1st paragraph of section 37-5.01D(2)(b) with:

04-15-22

For an asphaltic emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the introductory clause in the 1st paragraph of section 37-5.01D(2)(d) with:

04-15-22

For a parking area seal, the quality control laboratory must perform sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Replace the 2nd paragraph of section 37-6.01C with:

04-15-22

If your selected crack treatment material is not on the Authorized Material List for flexible pavement crack treatment material, submit a sample and test results from each batch or lot 20 days before use. Testing must be performed by a quality control laboratory and test results must comply with the specifications. Test reports must include the information specified for the certificate of compliance submittal. Each hot-applied crack treatment material sample must be a minimum of 3 lbs and submitted in a silicone release container. Each cold-applied crack treatment material sample must be a minimum of 2 quarts and submitted in a plastic container.

AA

39 ASPHALT CONCRETE

04-15-22

Replace 12 months at each occurrence in section 39 with:

10-15-21

24 months

Replace AASHTO T 324 (Modified) and AASHTO T 324 at each occurrence in section 39 with:

04-17-20

California Test 389

Delete the row for AASHTO T 324 in the table in the 5th paragraph of section 39-2.01A(1).

04-17-20

Add to the table in the 5th paragraph of section 39-2.01A(1):

10-16-20

ASTM D5095	2007
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Replace the 1st and 2nd paragraphs of section 39-2.01A(3)(d) with:

04-19-19

If ordered, submit QC test results within 3 business days of a request.

Delete the 1st paragraph of section 39-2.01A(4)(a).

04-17-20

Replace the 2nd paragraph of section 39-2.01A(4)(a) with:

10-16-20

Take samples under California Test 125. Reduce samples of HMA to testing size under California Test 306.

Replace item 2 in the list in the 2nd paragraph of section 39-2.01A(4)(b) with:

10-16-20

- 2. Asphalt binder. Take at least two 1-qt samples. If the asphalt binder is modified or rubberized, the asphalt binder must be sampled with the components blended in the proportions to be used.

Replace the 3rd, 4th, and 5th paragraphs of section 39-2.01A(4)(d) with:

10-15-21

The Engineer verifies the JMF for renewal under section 39-2.01A(4)(b) except:

1. Engineer keeps the samples until you provide test results for your part on a Contractor Job Mix Formula Renewal form.
2. Engineer may use the most recent aggregate quality test results within the past one year, or the Engineer may perform aggregate quality tests.
3. Engineer may use RAP and binder test results from the project where renewal samples are taken, or the Engineer may perform RAP and binder tests.
4. Department tests samples of materials obtained from the HMA production unit after you submit test results that comply with the mix design specifications.
5. After completion of the JMF verification renewal document review, the Engineer verifies each proposed JMF within 20 days of receiving the verification renewal samples and the complete Contractor Job Mix Formula Renewal form.
6. You may not adjust the JMF due to a failed verification.
7. For each HMA type and aggregate gradation specified, the Engineer verifies at no cost to you 1 proposed JMF renewal within a 24 month period.

Replace the 1st sentence in the 2nd paragraph of section 39-2.01A(4)(h)(i) with:

04-17-20

Condition each at-the-plant sample of HMA mixture for testing under AASHTO 283 in compliance with sections 7.1.2, 7.1.3, and 7.1.4 of AASHTO R 30.

Add to section 39-2.01A(4)(h)(v):

10-16-20

California Test 389 and AASHTO T 283 are not required if production start-up evaluation is within 45 days of the date the Hot Mix Asphalt Verification form is signed.

If production stops for more than 60 days, perform a production start-up evaluation. If production stops for more than 30 days but less 60 days, perform a reduced production start-up evaluation. Reduced production start-up evaluation is production start-up evaluation without California Test 389 and AASHTO T 283.

04-15-22

If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results. If production start-up evaluation fails, stop production.

Add between the 3rd and 4th paragraphs of section 39-2.01A(4)(i)(i):

04-19-19

You must assist in collecting Engineer acceptance samples. Sample in the presence of the Engineer. Split the Engineer acceptance samples into at least 4 parts. Engineer retains 3 parts and you keep 1 part.

Replace the 1st sentence in the 5th paragraph of section 39-2.01A(4)(i)(i) with:

04-17-20

The Engineer conditions each at-the-plant sample of HMA mixture for testing under AASHTO 283 in compliance with sections 7.1.2, 7.1.3, and 7.1.4 of AASHTO R 30.

Replace section 39-2.01A(4)(i)(iii) with:

04-15-22

39-2.01A(4)(i)(iii) Pavement Smoothness

39-2.01A(4)(i)(iii)(A) General

Schedule smoothness testing with the Engineer. Unless otherwise authorized, all smoothness testing must be performed in the presence of the Engineer.

Measure smoothness of new pavement alignment or pavement realignment with an inertial profiler. The Department determines smoothness pay adjustments using the Pay Adjustment for New Pavement Alignment or Pavement Realignment table in section 39-2.01A(4)(i)(iii)(B).

Measure smoothness of pavement constructed on existing pavement surfaces with an inertial profiler. The Department determines pay adjustments as shown in the applicable Pay Adjustment for Pavement Constructed on Existing Pavement Surfaces table in section 39-2.01A(4)(i)(iii)(C).

Measure smoothness of:

1. Existing asphalt concrete surface before performing any work on the surface and submit the result labeled as the *EXIST* inertial profiler data file. Notify the Engineer if MRI results vary more than 10 percent from the MRI information provided by the Department at the time of advertisement. For projects suspended for more than 30 days, measure the smoothness of the existing surface that has not received an HMA overlay and submit the result labeled as *EXISTR* inertial profiler data file.
2. Existing pavement segments if structural repairs such as remove and replace asphalt concrete or leveling courses are made and submit the result labeled as *BASELINE* inertial profiler data file.
3. Pavement segments, exclusive of OGFC on new HMA, before performing any HMA smoothness corrections and submit the result labeled as *PAVE* inertial profiler data file.
4. Pavement segments, exclusive of OGFC on new HMA, after performing any HMA smoothness corrective work and submit the results labeled as *FINAL* inertial profiler data file. Use the *PAVE* inertial profiler data as the *FINAL* inertial profiler data if there is no corrective work in the segment.
5. Pavement segments of OGFC before performing any OGFC smoothness correction and submit the result labeled as *PAVEO* inertial profiler data file.
6. Pavement segments of OGFC after performing any OGFC smoothness corrective work and submit the result labeled as *FINALO* inertial profiler data file. Use the *PAVEO* inertial profiler data file as the *FINALO* inertial profiler data file when no corrective work in the segment is performed.

MRI_0 is the lower MRI value from the *EXIST* and *BASELINE* profiles for the 0.1-mi segment.

Notify the Engineer 10 days before collecting inertial profiler data. Allow the Engineer 2 days after receipt of your data to complete inertial profiler verification of all data except the *FINAL* inertial profiler data. Allow the Engineer 10 days after receipt of your data to complete verification of *FINAL* inertial profiler data.

The Department uses the accepted inertial profiler data for acceptance and determination of the payment adjustment.

Segments may be correctively ground to improve pay adjustments to full pay. The Department does not allow corrective grinding into positive pay adjustments. The Department determines positive pay adjustment segments before any corrective grinding. Correction of ALR in positive pay adjustment segments cannot improve pay.

Corrective actions may be diamond grinding or remove and replace at your option and must comply with section 39-2.01C(16).

When OGFC is being placed over the surface of HMA, corrective actions apply to the HMA surface on which the OGFC is being placed. Smoothness requirements for OGFC are specified in section 39-2.04A(4)(c)(iii).

39-2.01A(4)(i)(iii)(B) Pay Adjustments for New Pavement Alignment or Pavement Realignment

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for New Pavement Alignment or Pavement Realignment

MRI _{SEG} (in/mi)	Pay adjustment per 0.1 mi per lane ≥ 0.3 ^a	Pay adjustment per 0.1 mi per lane <0.3 ^a	Corrective action
≤ 40.00	+ \$900.00	+ \$450.00	None
40.01–50.00	+ (50.00 - MRI _{SEG}) x \$90.00	+ (50.00 - MRI _{SEG}) x \$45.00	None
50.01–60.00	Full pay	Full pay	None
60.01–80.00	- (MRI _{SEG} - 60.00) x \$142.50	- (MRI _{SEG} - 60.00) x \$101.25	Optional
> 80.00	--	--	Mandatory

^aTotal HMA thickness exclusive of OGFC and HMA leveling courses and structural section repairs

No ALR over 160 in/mi are allowed.

39-2.01A(4)(i)(iii)(C) Pay Adjustments for Pavement Constructed on Existing Pavement Surfaces

The Department applies pavement smoothness payment adjustments using a pay range of target MRI. The target MRI (MRI_T) is determined based on the *EXIST* or *BASELINE* MRI (MRI₀) exclusive of the OGFC and the number of opportunities as shown in the following table:

Target MRI (MRI_T)

Number of opportunities	Target MRI (MRI _T) ^a
1	= 0.2 x MRI ₀ + 45
2	= 0.1 x MRI ₀ + 50
3 or more	= 55

^aIf the calculated MRI_T is less than 55, use MRI_T = 55

Opportunities for improving smoothness include:

1. A single lift of asphalt. Where an HMA layer thickness allows the layer to be placed in more than 1 lift, the number of opportunities will be equal to the maximum number of lifts the layer can be broken into regardless of aggregate size chosen.
2. Micro milling or cold planing not in the same shift as the paving. When you choose to micro mill or cold plane and pave in the same shift but have the option to micro mill or cold plane and pave in different shifts, the micro milling or cold planning will still be considered a separate opportunity.
3. Segment correction.

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for Pavement Constructed on Existing Pavement Surfaces

Pay Ranges ^b	Payment adjustment per 0.1 mi per lane $\geq 0.30'$ ^a	Payment adjustment per 0.1 mi per lane $< 0.30'$ ^a	Corrective action
$MRI_{SEG} \leq MRI_T - 20$	+ \$900.00	+ \$450.00	May only grind areas to meet ALR thresholds
$MRI_T - 20 < MRI_{SEG} \leq MRI_T - 5$	+ $((MRI_T - 5) - MRI_{SEG}) \times \60.00	+ $((MRI_T - 5) - MRI_{SEG}) \times \30.00	May only grind areas to meet ALR thresholds
$MRI_T - 5 < MRI_{SEG} \leq MRI_T + 5$	Full pay	Full pay	May only grind areas to meet ALR thresholds
$MRI_T + 5 < MRI_{SEG} \leq$ greater of 90 or $(MRI_T + 20)$	- $(MRI_{SEG} - (MRI_T + 5)) \times \190.00 , deduction not to exceed -\$2,850	- $(MRI_{SEG} - (MRI_T + 5)) \times \90.00 , deduction not to exceed -\$1,350	Corrective actions permitted
$MRI_{SEG} >$ greater of 90 or $(MRI_T + 20)$	--	--	Mandatory correction

^aTotal HMA thickness exclusive of OGFC and HMA leveling courses and structural section repairs.

^b MRI_{SEG} = the MRI of each 0.1-mile section of completed lane after all corrections.

No ALR greater than ALR_{MAX} are allowed. ALR_{MAX} is the greater value of 160 in/mi or calculated value using the following equation:

$$ALR_{MAX} = 2.1 \times MRI_T$$

39-2.01A(4)(i)(iii)(D) Verification Testing

The Engineer verifies your inertial profiler data under section 36-3.01D(3)(b)(ii).

Replace the 1st through 3rd paragraphs of section 39-2.01A(4)(i)(iv) with:

04-19-19

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. You and the Engineer may only dispute each other's test results if one party's test results pass and the other party's test results fail.

If there is a dispute, submit your test results and copies of paperwork including worksheets used to determine the disputed test results within 3 business day of receiving Engineer's test results. An independent third party performs referee testing. Before the third party participates in a dispute resolution, it must be qualified under AASHTO re:source program and the Department's Independent Assurance Program. The independent third party must have no prior direct involvement with this Contract. By mutual agreement, the independent third party is chosen from:

1. Department laboratory in a district or region not in the district or region the project is located
2. Transportation Laboratory
3. Laboratory not currently employed by you or your HMA producer

If the Department's portion of the split acceptance samples are not available, the independent third party uses any available material agreed by you and the Engineer as representing the disputed HMA for evaluation.

Replace the 1st paragraph of section 39-2.01B(2)(b) with:

04-17-20

If the proposed JMF indicates that the aggregate is being treated with dry lime or lime slurry with marination, or the HMA with liquid antistriper, then testing the untreated aggregate under AASHTO T 283 and California Test 389 is not required.

Replace section 39-2.01B(5) with:

10-16-20

39-2.01B(5) Liquid Antistriper Treatment

Do not use liquid antistriper as a substitute for asphalt binder.

Total amine value for amine-based liquid antistriper must be a minimum of 325 when tested under ASTM D2074. Dosage for amine-based liquid antistriper must be from 0.25 to 1.00 percent by weight of asphalt.

Nonvolatiles content of organosaline-based liquid antistriper must be 40 percent minimum when tested under ASTM D5095. Dosage for organosaline-based liquid antistriper must be from 0.05 to 0.15 percent by weight of asphalt.

Use only 1 liquid antistriper type or brand at a time. Do not mix liquid antistriper types or brands.

Store and mix liquid antistriper under the manufacturer's instructions.

Replace section 39-2.01C(3)(d) with:

04-15-22

39-2.01C(3)(d) Reserved

Replace section 39-2.01C(3)(e) with:

04-15-22

39-2.01C(3)(e) Prepaving Corrections

39-2.01C(3)(e)(i) General

Section 39-2.01C(3)(e) applies to existing asphalt concrete surfaces if a bid item for Segment Correction is shown in the Bid Item List.

When micro milling is used, the cold planing equipment and operation must comply with section 39-3.04C. The micro milling drum must have cutting teeth that are:

1. Tungsten-carbide or diamond tipped
2. Spaced no greater than 1/4-inch apart on center
3. Configured such that the deviation in elevation between any 2 teeth does not exceed 1/16 inch

Dispose of grinding or micro milling residue.

Pave within 7 days of prepaving corrections.

The final pavement surface must comply with section 39-2.01A(4)(i)(iii).

39-2.01C(3)(e)(ii) Segment Correction

Section 39-2.01C(3)(e)(ii) applies to existing asphalt concrete segments if a bid item for segment correction number of 0.1-mi sections is shown on the Bid Items List.

Develop a correction plan and submit within 5 days before making segment corrections. Include the maximum removal depth according to the ProVAL smoothness assurance analysis grinding report or other 3D modeling software report. Do not remove more than 15 percent of the existing pavement thickness.

Correction includes one or a combination of the following:

1. Diamond grinding in the wheel paths, the entire surface, or cold planer or paver smoothness referencing locations
2. Micro milling in the wheel paths, the entire surface, or cold planer or paver smoothness referencing locations
3. 3D modeling of the existing roadway and subsequent automatic machine guidance of either cold planer, paver, or both
4. Alternative method of correction authorized by the Engineer that complies with final HMA pavement smoothness requirements

Upon authorization of your correction plan, correct the existing roadway.

Segment correction is considered an opportunity for improvement.

Notify the Engineer of those areas where existing pavement depth limits a 0.1-mi segment correction. The Engineer may order you to:

1. Not perform correction of the 0.1-mi segment. The *EXIST* profile MRI will be the MRI₀. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C).
2. Correct to a limited depth and measure smoothness of the corrected areas with an inertial profiler. The profile after making correction will be the *BASELINE* profile. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C). Do not consider this correction as an opportunity for the percent improvement MRI_T determination.
3. Correct by a different method and measure smoothness of the corrected 0.1-mi segment with an inertial profiler. Corrective work performed by a different method is change order work. The profile after making correction will be the *BASELINE* profile. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C).

**Replace the table in the 3rd paragraph of section 39-2.01C(3)(f) with:
Tack Coat Application Rates for HMA**

04-17-20

HMA over:	Minimum residual rates (gal/sq yd)		
	CSS-1/CSS-1h, SS-1/SS-1h, and QS-1h/CQS-1h asphaltic emulsion	CRS-1/CRS-2 and QS-1/CQS-1 asphaltic emulsion	Asphalt binder and PMCRS-2/PMCRS-2h asphaltic emulsion
New HMA (between layers)	0.02	0.03	0.02
Concrete pavement and existing asphalt concrete surfacing	0.03	0.04	0.03
Planed pavement	0.05	0.06	0.04

Replace the 9th paragraph of section 39-2.01C(3)(f) with:

04-16-21

If authorized, you may change the tack coat application rates.

Replace the 1st sentence in the 1st paragraph of section 39-2.01C(4)(a) with:

04-15-22

Longitudinal joints in the top layer must match lane lines or be offset 0.5 foot, if ordered, to avoid permanent pavement delineation conflicts.

Replace section 39-2.02A(4)(b)(iii) with:

04-16-21

39-2.02A(4)(b)(iii) Reclaimed Asphalt Pavement

Sample and test mix design RAP stockpile under California Test 384. Report the average AASHTO T 308 uncorrected binder content on page 4 of your Contractor Hot Mix Asphalt Design Data form. When the mix design RAP stockpile is augmented, sample RAP used to augment the stockpile at a minimum frequency of 1 sample per 1,000 tons under California Test 384 before augmenting the stockpile. Test each sample to determine the uncorrected binder content under AASHTO T 308. Average the results of the 3 tests. When tested under AASHTO T 308, the uncorrected binder content of each augmented RAP sample must be within ± 2.00 percent of the average uncorrected asphalt binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form. You must use the same ignition oven used to determine the uncorrected asphalt binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

The augmented RAP sample when tested under AASHTO T 209 must be within ± 0.06 of the average maximum specific gravity reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

During Type A HMA production, sample RAP twice daily and perform QC testing for:

1. Aggregate gradation at least once a day under California Test 384
2. Moisture content at least once a day

04-17-20

Replace footnote a in the table in item 1 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-18-19

^aThe Engineer determines combined aggregate gradations containing RAP under California Test 384. The Engineer uses the correlation factor from Contractor Hot Mix Asphalt Design Data form and mathematically combines the virgin and corrected RAP aggregate gradations at the correct proportions to obtain the combined gradation.

Replace the table in item 2 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-18-19

Reclaimed Asphalt Pavement Quality

Quality characteristic	Test method	Requirement
Uncorrected binder content (% within the average value reported ^a)	AASHTO T 308	± 2.00
Specific gravity (within the average value reported ^b)	AASHTO T 209	± 0.06

^aAverage uncorrected binder content of three ignition oven tests performed at JMF verification. Engineer must use the same ignition oven used to determine the average uncorrected binder content at JMF verification.

^bAverage maximum specific gravity reported on page 4 of Contractor Hot Mix Asphalt Design Data form.

Replace the row for *Moisture susceptibility (min, psi, dry strength)* in the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e) with:

04-19-19

For RAP substitution equal to or less than 15% moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
For RAP substitution greater than 15% moisture susceptibility (psi, dry strength)	AASHTO T 283	100-300 ^h

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in item 3 in the paragraph of section 39-2.02A(4)(e) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389	Report only
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Replace the row for *Moisture susceptibility (min, psi, wet strength)* in the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-16-20

Moisture susceptibility (min, psi, wet strength)	AASHTO T 283 ⁱ	70
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Add a footnote to the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e):

04-19-19

^hNot required in the following areas:

1. Southern San Luis Obispo or Santa Barbara County in District 5.
2. Kern County in District 6.
3. Kings County in District 6: route 5, post mile 0 to 17; route 33, post mile 0 to 19; route 41, post mile 0 to 16.
4. Tulare County in District 6: route 65, post mile 0 to 10; route 99, post mile 0 to 10; route 43, post mile 0 to 15.

Add footnote *i* to the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e):

10-16-20

ⁱFreeze thaw required

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the 1st paragraph of section 39-2.02B(2) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389 ^c	Report only
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Replace the row for *Moisture susceptibility, dry strength* in the table in the 1st paragraph of section 39-2.02B(2) with:

04-19-19

For RAP substitution equal to or less than 15% moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
For RAP substitution greater than 15% moisture susceptibility (psi, dry strength)	AASHTO T 283	100-300 ^e

Add a footnote to the table in the 1st paragraph of section 39-2.02B(2):

04-19-19

°Not required in the following areas:

1. Southern San Luis Obispo or Santa Barbara County in District 5.
2. Kern County in District 6.
3. Kings County in District 6: route 5, post mile 0 to 17; route 33, post mile 0 to 19; route 41, post mile 0 to 16.
4. Tulare County in District 6: route 65, post mile 0 to 10; route 99, post mile 0 to 10; route 43, post mile 0 to 15.

Replace the 3rd and 4th paragraphs of section 39-2.02B(2) with:

04-19-19

For RAP substitution of 15 percent or less, the grade of the virgin binder must be the specified grade of asphalt binder for Type A HMA.

For RAP substitution greater than 15 percent and not exceeding 25 percent, the grade of the virgin binder must be the specified grade of asphalt binder for Type A HMA with the upper and lower temperature classification reduced by 6 degrees C. Hamburg wheel track requirements are based on the grade of asphalt binder specified for Type A HMA.

Replace the 2nd sentence in the 2nd paragraph of section 39-2.02B(11) with:

04-19-19

For RAP substitution of 15 percent or less, RAP must be within ± 3 of RAP percentage shown in your Contractor Job Mix Formula Proposal form without exceeding 15 percent. For RAP substitution of greater than 15 percent, RAP must be within ± 3 of RAP percentage shown in your Contractor Job Mix Formula Proposal form without exceeding 25 percent.

Replace the row for *Hamburg wheel track (min number of passes at 0.5-inch rut depth)* in the table in item 2 in the paragraph of section 39-2.03A(4)(e)(i) with:

04-17-20

Hamburg wheel track (min number of passes at 0.5-inch rut depth)	California Test 389	
Base binder grade:		
PG 64 or lower		15,000
PG 70		20,000

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in item 2 in the paragraph of section 39-2.03A(4)(e)(i) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389	Report only
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Replace the row for *Moisture susceptibility (min, psi, wet strength)* in the table in item 2 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

10-16-20

Moisture susceptibility (min, psi, wet strength)	AASHTO T 283 ^g	70
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Add footnote *g* to the table in item 2 in the list in the paragraph of section 39-2.03A(4)(e)(i):

10-16-20

⁹Freeze thaw required

Replace the last sentence in the 1st paragraph of section 39-2.03A(4)(e)(ii)(D) with:

04-15-22

Each sample must be placed into six 1-qt cans with open tops and friction lids.

Replace the row for *Hamburg wheel track (min number of passes at 0.5-inch rut depth)* in the table in 1st paragraph of section 39-2.03B(2) with:

04-17-20

Hamburg wheel track (min number of passes at 0.5-inch rut depth) Base binder grade: PG 64 or lower PG 70	California Test 389 ^d	15,000 20,000
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Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in 1st paragraph of section 39-2.03B(2) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389 ^d	Report only
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Replace section 39-2.04A(4)(c)(iii) with:

04-15-22

39-2.04A(4)(c)(iii) Pavement Smoothness of OGFC

39-2.04A(4)(c)(iii)(A) General

The pavement smoothness of a 0.1 mi segment of OGFC must comply with the requirements shown in the following table:

OGFC Pavement Smoothness Acceptance Criteria

OGFC placement on	Applicable section
Existing pavement	39-2.04A(4)(c)(iii)(B)
Existing pavement with cold plane	39-2.04A(4)(c)(iii)(C)
HMA overlay or new construction	39-2.04A(4)(c)(iii)(D)

Corrective action is required only to reduce ALR below the maximum allowed. Corrective action must not reduce pavement thickness more than allowed in section 39-2.01C(16). Correction may be diamond grinding or remove and replace at your option. The maximum pay adjustment for remove and replace areas is full pay.

39-2.04A(4)(c)(iii)(B) OGFC Paved on Existing Pavement

The target MRI for OGFC (MRI_{TO}) is determined using the following equation:

$$MRI_{TO} = (0.2 \times MRI_o + 45) \text{ or } 55, \text{ whichever is larger}$$

where:

MRI_0 = the lower of the *EXIST* MRI or *BASELINE* MRI

MRI_{SEGO} = MRI of each 0.1-mi segment from *PAVEO* profile for OGFC paving

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified profiler data as shown in the following table:

Pay Adjustment for OGFC Paved on Existing Pavement

Pay Ranges	Payment adjustment per 0.1 mi per lane	Corrective action
$MRI_{SEGO} \leq MRI_{TO} - 20$	+ \$450.00	May only grind to meet ALR thresholds
$MRI_{TO} - 20 < MRI_{SEGO} \leq MRI_{TO} - 5$	+ $((MRI_{TO} - 5) - MRI_{SEGO}) \times \30.00	May only grind to meet ALR thresholds
$MRI_{TO} - 5 < MRI_{SEGO} \leq MRI_{TO} + 5$	Full pay	May only grind to meet ALR thresholds
$MRI_{TO} + 5 < MRI_{SEGO} \leq MRI_{TO} + 20$	- $(MRI_{SEGO} - (MRI_{TO} + 5)) \times \90.00	May only grind to meet ALR thresholds
$MRI_{SEGO} > MRI_{TO} + 20$	- $(MRI_{SEGO} - (MRI_{TO} + 5)) \times \90.00	May only grind to meet ALR thresholds

No ALR greater than ALR_{MAX} is allowed. ALR_{MAX} is the greater value of 160 in/mi or calculated value using the following equation:

$$ALR_{MAX} = 2.1 \times MRI_{TO}$$

39-2.04A(4)(c)(iii)(C) OGFC Paved on Existing Pavement with a Cold Planed Surface

The Department applies pavement smoothness pay adjustments to segments where a bid item for cold plane asphalt concrete applies as shown in the following table:

Pay Adjustment for OGFC Paved on Existing Pavement with a Cold Planed Surface

MRI_{SEG} (in/mi)	Pay adjustment per 0.1 mi per lane	Corrective action
≤ 55.00	+ \$450.00	May only grind to meet ALR thresholds
55.01–70.00	+ $(70.00 - MRI_{SEGO}) \times \30.00	May only grind to meet ALR thresholds
70.01–80.00	Full pay	May only grind to meet ALR thresholds
> 80.00	- $(MRI_{SEGO} - 80.00) \times \135.00	May only grind to meet ALR thresholds

MRI_{SEGO} = MRI of each 0.1-mi segment from *PAVE* profile for OGFC paving.

No ALR over 160 in/mi are allowed.

39-2.04A(4)(c)(iii)(D) OGFC Paved on New Construction or HMA Overlay

The Department determines payment adjustments using a percent of targeted MRI (PoT) for the OGFC. The MRI_{TO} of the segment must be less than or equal to $MRI_{FINALHMA}$.

Determine the Percent of Target MRI (PoT) of each completed 0.1-mi segment of lane using the following equations:

$$(\%) PoT = (MRI_{SEGO} / MRI_{TO}) \times 100 \text{ rounded to the nearest tenth of 1 percent}$$

where:

MRI_{SEGO} = MRI of each 0.1-mi segment from *PAVEO* profile for OGFC paving.

$MRI_{FINALHMA}$ = Final MRI of HMA layer where OGFC is placed

$MRI_{TO} = MRI_{FINALHMA}$ or 55, whichever is larger.

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for OGFC on New Construction or HMA Overlay

PoT	Payment adjustment per 0.1 mi per lane	Corrective action
PoT ≤ 100% of MRI_{TO}	Full pay	May only grind to meet ALR thresholds
PoT > 100% of MRI_{TO}	$-(PoT - 100.00) \times \$100.00$	May only grind to meet ALR thresholds

No ALR over 160 in/mi are allowed.

**Replace the table in the 3rd paragraph of section 39-2.04C with:
Tack Coat Application Rates for OGFC**

04-17-20

OGFC over:	Minimum residual rates (gal/sq yd)		
	CSS-1/CSS-1h, SS-1/SS-1h, and QS-1h/CQS-1h asphaltic emulsion	CRS-1/CRS-2 and QS-1/CQS-1 asphaltic emulsion	Asphalt binder and PMCRS-2/PMCRS-2h asphaltic emulsion
New HMA	0.03	0.04	0.03
Concrete pavement and existing asphalt concrete surfacing	0.05	0.06	0.04
Planed pavement	0.06	0.07	0.05

Replace the 8th and 9th paragraphs of section 39-2.04C with:

04-19-19

For RHMA-O and RHMA-O produced with WMA water injection technology, and RHMA-O-HB and RHMA-O-HB produced with WMA water injection technology:

1. Spread and compact if the ambient air temperature is at least 55 degrees F and the surface temperature is at least 60 degrees F
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 280 degrees F
3. Complete compaction before the surface temperature drops below 250 degrees F

For RHMA-O produced with WMA additive technology and RHMA-O-HB produced with WMA additives technology:

1. Spread and compact if the ambient air temperature is at least 45 degrees F and the surface temperature is at least 50 degrees F
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 270 degrees F
3. Complete compaction before the surface temperature drops below 240 degrees F

Spread sand at a rate from 1 to 2 lb/sq yd on RHMA-O and RHMA-O-HB with or without WMA technology pavement after finish rolling activities are complete. Keep traffic off the pavement until spreading of the sand is complete.

Replace the 2nd paragraph of section 40-1.01C(4) with:

10-15-21

At least 15 days before starting field qualification, submit the proposed concrete mix proportions, the corresponding mix identifications, and laboratory test reports, including measurements of 3 modulus of rupture and 3 compressive strength, for each trial mixture at 3, 7, 14, 21, 28, and 42 days.

Replace the 2nd paragraph of section 40-1.01C(9) with:

10-19-18

Submit your coefficient of thermal expansion test data at:

<https://dime.dot.ca.gov/>

Replace the 3rd paragraph of section 40-1.01D(1) with:

10-15-21

Provide material, labor and equipment that meets the initial curing requirement to assist the Engineer in fabricating, curing and handling specimens for the Department's modulus of rupture and compressive strength testing. Failure to maintain the proper curing environment during initial cure will not be basis for rejection of samples, dispute resolution, or claim against the Department. Secure the initial curing equipment at all times to protect against theft and damage.

Add to the list in the 3rd paragraph of section 40-1.01D(3):

10-15-21

17. Compressive strength

Replace the 3rd paragraph of section 40-1.01D(5) with:

10-15-21

To determine the minimum content of cementitious materials or the maximum ratio of water to cementitious materials, use the compressive strength equivalent to modulus of rupture values of at least 570 psi for 28 days age and at least 650 psi for 42 days age. Compressive strength must be tested under CT 521.

Replace the row for *Density* in the table in the 1st paragraph of section 40-1.01D(7)(a) with:

04-17-20

Unit weight	California Test 518	1 per 4 hours
-------------	---------------------	---------------

Add to the list in the 4th paragraph of section 40-1.01D(7)(a):

04-17-20

6. Unit weight

Replace item 2 in the list in the 8th paragraph of section 40-1.01D(7)(a) with:

04-17-20

2. 1 point falls outside the suspension limit line for individual penetration, unit weight or air content measurements

Replace the 2nd paragraph of section 40-1.01D(7)(b) with:

10-15-21

For field qualification, the compressive strength must be equivalent to a modulus of rupture at an age of 42 days or earlier of at least:

1. 625 psi for each single beam
2. 650 psi for the average of 3 beams

Replace the row for *modulus of rupture at 28 days* in the table in the 1st paragraph of section 40-1.01D(8)(a) with:

10-15-21

Compressive strength at 42 days	California Test 521	1,000 cu yd
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Replace n_v in the 1st paragraph of section 40-1.01D(8)(b)(ii) with:

04-17-20

n_v = number of Department's tests (minimum of 3 required)

Replace the 4th paragraph of section 40-1.01D(8)(b)(ii) with:

04-17-20

If your QC test results are not verified, core at least 3 specimens from the concrete pavement under section 40-1.03M. For dispute resolution, the Engineer selects the core locations and the Department contracts with an independent testing laboratory or uses the Department's laboratory to test these specimens for air content under ASTM C457. The Engineer compares these test results with your QC test results using the t-test method. If your QC test results are verified based on this comparison, the Engineer uses your QC test results for acceptance of concrete pavement for air content, otherwise, the Engineer uses the test results from the dispute resolution process and you pay for the independent testing.

Replace the row for *modulus of rupture at 28 days* in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

10-15-21

Compressive strength at 42 days (min, psi)	California Test 521	650 ^b equivalent modulus of rupture to compressive strength
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Replace the row for pavement smoothness in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

04-15-22

Pavement smoothness	California Test 387, AASHTO R 56, and AASHTO R 57	<ol style="list-style-type: none"> 1. No area of localized roughness greater than 160 in/mi, except when grinding existing pavement 2. For Mean Roughness Index (MRI) acceptance, refer to the Concrete Pavement Smoothness Selection Table in section 40-1.01D(8)(c)(iii)
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Replace the note *b* in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

10-15-21

^bAverage of the individual test results of 3 cylinders

Replace section 40-1.01D(8)(c)(iii) with:

04-15-22

40-1.01D(8)(c)(iii) Pavement Smoothness

The Department verifies and accepts pavement smoothness based on the results of your inertial profiler testing under section 36-3.

For grinding existing concrete pavement, measure profile:

1. Before any work is performed to calculate existing MRI
2. After any pavement replacement work is performed but before grinding to calculate baseline MRI
3. After grinding is complete to calculate final MRI

For all other concrete pavement project types, measure profile:

1. After placing concrete but before performing any smoothness correction to calculate pavement MRI
2. After performing any smoothness correction to calculate final MRI

Pavement smoothness is measured under section 36-3. The following tables show the pavement and project types and the applicable smoothness. A partial section less than 0.05 mi will not receive proportional pay adjustment but still must meet ALR thresholds.

Concrete Pavement Smoothness Selection Table

Pavement Type	Project Type	Smoothness Table
CRCP	New alignment	Target 60
	Widening or lane replacement	Target 67.5
JPCP	New alignment	
	Widening or lane replacement	
CRCP/JPCP	Grinding existing concrete pavement	Percent Improvement (PI)

Target 60 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action ^a
≤ 45.00	+ \$1500	None
45.01 – 55.00	+ ((55 - MRI) x \$150)	None
55.01 – 65.00	0	None
65.01 – 80.00	- ((MRI - 65) x \$150)	Optional ^b
> 80.00	-	Mandatory ^c

^aCorrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.

^bDiamond grinding allowed.

^cCorrection is diamond grinding.

Target 67.5 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action ^a
≤ 50.00	+ \$1500	None
50.01 – 60.00	+ ((60 - MRI) x \$150)	None
60.01 – 75.00	0	None
75.01 – 90.00	- ((MRI - 75) x \$150)	Optional ^b
> 90.00	-	Mandatory ^c

^aCorrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.

^bDiamond grinding allowed.

^cCorrection is diamond grinding.

Target 75 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action ^a
≤ 50.00	+ \$1500	None
50.01 – 60.00	+ ((60 - MRI) x \$150)	None
60.01 – 90.00	0	None
> 90.00	-	Mandatory ^b

^aCorrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.

^bMandatory correction is diamond grinding.

The Department does not pay for mandatory smoothness corrections. Grinding to improve pay to positive pay adjustments is allowed if thickness is not deficient under section 40-1.01D(8)(c)(iv). Pavement smoothness pay adjustments are applied in addition to other pay adjustments.

The corrective action for grinding existing concrete pavement project types or new continuous PCP is based on the final MRI, as shown in the following table:

Percent Improvement Smoothness Table

0.1-mi MRI _{exist} ^a (in/mi)	0.1-mi MRI _{final} ^b (in/mi)	Corrective Action
≤ 100	≤ 60	None
	>60	Mandatory ^c
> 100	≤ 0.6 x MRI _{exist}	None
	> 0.6 x MRI _{exist}	Mandatory ^c

^aExisting MRI.

^bFinal MRI.

^cMandatory correction is another pass of diamond grinding.

Replace section 40-1.01D(8)(c)(v) with:

04-17-20

40-1.01D(8)(c)(v) Determining Modulus of Rupture from Pavement Cores

For each approved mix design, a correlation between flexural beam strength and compressive core strength may be developed to evaluate low modulus of rupture results from projects. If the average 28-day modulus of rupture is below 570 psi, you may use compressive strength results from pavement cores to determine the equivalent 28-day modulus of rupture.

In the presence of engineer:

1. From the test strip, fabricate an additional 3 beams, and take a total of 15 cores under ASTM C42 to test 3 cores at each age of 28, 42, 56, 70, and 91 days.
2. If test strip is not constructed, fabricate additional 3 beams on the first day of production and placement of concrete pavement, and take total 15 cores under ASTM C42 to test 3 cores at each age of 28, 42, 56, 70, and 91 days.
3. Break 3 beams at 28 days and take the average.
4. Break 3 cores at each age of 28, 42, 56, 70, and 91 days under ASTM C 39 and take the average at each age.

Use the following formula to calculate the equivalent 28-day modulus of rupture:

$$MOR = MORs \times [Cp(t)/Cs(t)]^{1/2}$$

where:

MOR = equivalent 28-day modulus of rupture in psi

MORs = average modulus of rupture in psi of 3 beams taken from the test strip at 28 days

Cs(t) = average compressive strength in psi of 3 cores taken from the test strip at (t): 28, 42, 56, 70, or 91 days under ASTM C39

Cp(t) = average compressive strength in psi of 3 cores taken from the pavement project at (t): 28, 42, 56, 70, or 91 days under ASTM C39

Submit all test results to engineer on the same date of completion of testing.

If the 28-day modulus of rupture is below 570 psi, select an age equal to one of the test ages from the test strip and drill 3 concrete cores under ASTM C42 of same diameter as the test strip from the area not complying to the acceptance strength requirement and test in presence of engineer for compressive strength under ASTM C39. The average compressive strength of 3 concrete cores will be used to determine the equivalent 28-day modulus of rupture.

Replace introductory clause in the 4th paragraph of section 40-1.03J with:

10-15-21

Do not allow traffic or use equipment on concrete pavement before the concrete has attained a modulus of rupture of 550 psi, or equivalent compressive strength if using maturity per section 40-1.03L, based on your testing unless:

Add to the list in the 4th paragraph of section 40-1.03J:

04-17-20

- 2.5 You must monitor for damage and immediately discontinue access and suspend operations if any damage becomes apparent

Replace section 40-1.03L with:

10-15-21

40-1.03L Use of the Maturity to Determine Opening to Traffic Concrete Strength

As an alternative to modulus of rupture testing, you can use the maturity method under ASTM C1074 to estimate the equivalent compressive strength for opening to traffic, use of equipment, and for early use of concrete pavement under section 40-1.03K.

Provide, install, and maintain all the maturity testing equipment.

Develop the strength-maturity relationship using:

1. Specimens prepared under ASTM C1074
2. Datum temperature of 14 degrees F
3. Nurse-Saul Method
4. Logarithmic best-fit curve with a R^2 value of at least 0.90

Develop the strength-maturity relationship in the laboratory when you are designing your mix or in the field during the test strip or first day of production and submit the results to the Engineer. During test strip and production:

1. Place a sensor at mid-depth and at 1.5 ft from the edge of pavement at the beginning and at the end of the placement.
2. Estimate in-place strength of concrete based on your strength-maturity relationship per ASTM C1074.
3. Validate once for test strip and every 15,000 cubic yards or 30 days of concrete production, whichever comes first

The maturity method is not used to estimate compressive strength for acceptance of concrete pavements.

Replace section 40-1.03N with:

10-16-20

40-1.03N Spall and Ravel Repair

Repair spalled or raveled areas that are any of the following:

1. Deeper than 0.05 foot
2. Wider than 0.10 foot
3. Longer than 0.30 foot

Repair spalls or ravels under section 41-4 and complete the repairs before opening a lane or lanes to traffic. Remove and replace JPCP slabs that have combined raveled areas more than 5 percent of the total slab area or a single raveled area more than 4 sq ft.

Replace the 2nd paragraph of section 40-1.03O with:

10-15-21

Do not start corrective work until:

1. Pavement has at least a 550 psi modulus of rupture or equivalent compressive strength if using maturity under section 40-1.03L
2. Corrective method is authorized

Replace section 40-2 with:

10-18-19

40-2 CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

40-2.01 GENERAL

40-2.01A Summary

Section 40-2 includes specifications for constructing continuously reinforced concrete pavement.

Constructing continuously reinforced concrete pavement includes terminal joints and expansion joints.

40-2.01B Definitions

Reserved

40-2.01C Submittals

For field qualification, submit the test data for the coefficient of thermal expansion of the concrete.

If you request to use plastic chairs to support the transverse bars, submit a sample of the plastic chair, including:

1. Manufacturer's instructions for the applicable use and load capacity
2. Chair spacing
3. Your calculation for the load on a chair for the area of bar reinforcement it supports

During production, submit the test data for the coefficient of thermal expansion as an informational submittal.

40-2.01D Quality Assurance

For field qualification, test the coefficient of thermal expansion of the concrete under AASHTO T 336. The coefficient of thermal expansion must not exceed 6.0 microstrain/degree F.

During the evaluation of the test strip, the Engineer visually checks the reinforcement and dowel and tie bar placement.

During production, test the coefficient of thermal expansion of the concrete at a frequency of 1 test for each 5,000 cu yd of paving but not less than 1 test for a project with less than 5,000 cu yd of concrete.

40-2.02 MATERIALS

40-2.02A General

Reserved

40-2.02B Transverse Bar Assembly

Transverse bar assemblies may be used to support longitudinal bars instead of transverse bars and other support devices.

40-2.02C Intermediate Transverse Bars

Intermediate transverse bars do not need to be epoxy-coated for a project not shown to be in a high desert or any mountain climate region.

40-2.02D Joints

Joint seals for transverse expansion joints must comply with section 51-2.02.

Geosynthetic bond breaker for expansion joint support slabs must comply with section 36-2.

40-2.03 CONSTRUCTION

40-2.03A General

Reserved

40-2.03B Bar Reinforcement

Place bar reinforcement under section 52-1.03D except you may request to use plastic chairs. Plastic chairs will be considered only for support directly under the transverse bars. You must demonstrate the vertical and lateral stability of the bar reinforcement and plastic chairs during the construction of the test strip.

For a transverse bar in a curve with a radius under 2,500 feet, place the reinforcement in a single continuous straight line across the lanes and aligned with the radius point as shown.

Lap splice bar reinforcement under section 52-6. For low carbon, chromium-steel bar reinforcement, the length of lap splice must be at least 30 inches.

40-2.03C Construction Joints

Transverse construction joints must be perpendicular to the lane line. Construct the joints so that the nearest longitudinal bar splice is at least 42 inches away from each side of the joint.

Clean joint surfaces before placing concrete against the surfaces. Remove laitance, curing compound, and other foreign materials.

40-2.03D Correcting Noncompliant Pavement Work

40-2.03D(1) General

The specifications for repairing cracks in section 40-1.03N do not apply to CRCP. Do not apply high-molecular-weight methacrylate to cracks in CRCP.

CRCP that develops raveling areas of 6 by 6 inches or greater requires partial depth repair.

40-2.03D(2) Partial Depth Repair

Partial depth repair must comply with section 41-4 except:

1. Determine a rectangular boundary which extends 6 inches beyond the damaged area. The depth of the saw cut must be between 2 inches from the surface to 1/2 inch above the longitudinal bars.
2. Provide additional reinforcement if each length of the repair boundaries is equal to or greater than 3 feet.

40-2.03D(3) Full-Depth Repair

40-2.03D(3)(a) General

Remove the full-depth of CRCP except for the portion of reinforcement to remain in place. Provide continuity of the reinforcement. For low carbon, chromium-steel bar reinforcement, the length of lap splice must be at least 30 inches. Splicing must comply with section 52-6. Do not damage the base, concrete, and reinforcement to remain in place. Place concrete in the area where you removed CRCP.

40-2.03D(3)(b) Transverse Cracks

Make initial full-depth transverse saw cuts normal to the lane line a distance of 3 feet on each side of the transverse crack.

40-2.03D(3)(c) Longitudinal Cracks

Remove the cracked area normal to the lane line for the full width of the lane a distance of 1 foot beyond each end of the crack. You may propose alternate limits with your repair plan.

40-2.03E Reserved

40-2.04 PAYMENT

Not Used

Add to the end of section 40-4.03B:

10-16-20

Replace JPCP for 4.5 feet on both sides of a joint with a rejected dowel bar.

Replace section 40-4.03C with:

10-16-20

40-4.03C Correcting Cracks

Correct JPCP cracks as follows:

1. Repair working cracks.
2. Remove and replace JPCP slabs that have uncontrolled cracks from joint to joint or edge to edge.
3. For other uncontrolled cracks, stop production, notify the Engineer, and submit a Corrective Action Plan for approval.

The Corrective Action Plan must include the following:

1. Root-cause analysis
2. Details for location, orientation, width, and depth of cracks
3. Proposed procedures for treatment or replacement
4. Details for demonstrating compliance with approved treatment procedures
5. Corrective steps to prevent reoccurrence

If the joints are sealed, repair working cracks by routing and sealing. Use a router mounted on wheels with a vertical shaft and a routing spindle that moves along the crack on its caster wheels. Form a reservoir 3/4-inch deep by 3/8-inch wide in the crack and fill with sealant. The equipment must not cause raveling or spalling.

Treat the contraction joint adjacent to the working crack by either of the following methods:

1. Applying epoxy resin under ASTM C881/C881M, Type IV, Grade 2
2. Pressure injecting epoxy resin under ASTM C881/C881M, Type IV, Grade 1

AA

41 EXISTING CONCRETE PAVEMENT

10-15-21

Replace the 4th paragraph of section 41-1.03D with:

10-15-21

Place portland cement concrete and modified high-alumina concrete on surfaces treated with a bonding agent recommended by the concrete manufacturer. If no bonding agent is recommended by the manufacturer, place concrete on damp surfaces that are not saturated.

Replace the 1st and 2nd paragraphs of section 41-2.02B with:

10-15-21

Grout must consist of Type II portland cement or Type IL cement, fly ash, and water. Use from 2.4 to 2.7 parts fly ash to 1 part portland cement or portland limestone cement by weight. Use enough water to produce the following grout efflux times determined under California Test 541, Part D:

1. From 10 to 16 seconds for subsealing
2. From 10 to 26 seconds for jacking

Cement for grout must comply with the specifications for Type II portland cement or Type IL cement in section 90-1.02B(2).

DIVISION VI STRUCTURES

46 GROUND ANCHORS AND SOIL NAILS

10-15-21

Replace section 46-1.01C(2) with:

04-17-20

46-1.01C(2) Shop Drawings

46-1.01C(2)(a) General

Submit shop drawings and supporting calculations to OSD, Documents Unit for initial review. Notify the Engineer of the submittal. Include in the notification the date and contents of the submittal.

Submit 6 copies of the general project information, 5 copies of the fabricators plan, and 3 copies of the construction plan.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Allow 30 days for the Department's review.

After review, submit from 6 to 12 copies of final shop drawings and supporting calculations, as requested, for authorization and use during construction.

46-1.01C(2)(b) General Project Information Plan

General project information plan must include:

1. Name, address, email address, and phone number of the contractor or subcontractor performing the work.
2. Wall construction schedule with construction sequence.
3. Wall construction staging schedule and layout of ground anchors and soil nails with identification numbers of ground anchors and soil nails based on the following labeling convention:

04-16-21

 - 3.1. Identification number "r_ccc", where "r" represents row numbers starting with "1" or "A" from top to bottom and "ccc" represents column numbers starting with "001" from down-station to up-station.
 - 3.2. For structures that include both ground anchors and soil nails, use separate identification systems and add "GA" for ground anchors and "SN" for soil nails preceding the identification numbers.
 - 3.3. Identify sacrificial test ground anchors and soil nails based on the nearest down-station production ground anchor and soil nail. Label the test type with "Proof Test", "Verification Test", or "Performance Test" preceding the identification numbers.
4. Table of lengths, tendon sizes, centralizers, and drilled-hole diameters.

04-17-20
5. For ground anchors, calculations for determining the bonded length and assumed bonded strength. Do not rely on any capacity from the grout-to-ground bond within the unbonded length.
6. Procedures for installing verification and proof test nails.
7. Bench width requirements for installation equipment.
8. Excavation lift height and maximum duration of exposure for each wall zone, including:
 - 8.1. Methods to stabilize the exposed excavated face if face is not maintaining its integrity
 - 8.2. Supporting calculations

46-1.01C(2)(c) Fabrication Plan

Fabrication plan must include:

1. Details and specifications for:
 - 1.1. Ground anchors and anchorage system
 - 1.2. Production and test soil nails
2. Corrosion protection details and repair procedure for:
 - 2.1. Damaged sheathing
 - 2.2. Couplers

04-16-21

- 3. Testing equipment, including:
 - 3.1. Jacking frame and appurtenant bracing.
 - 3.2. Method and equipment for measuring movement during testing.

10-15-21

- 3.3. Calculations that demonstrate the jacking frame and appurtenant bracing can support the test equipment at maximum test load on the (1) soils or (2) structural element with factor of safety for bearing capacity greater than 2.0.

04-17-20

- 4. For ground anchors, details for the transition between the corrugated plastic sheathing and the anchorage assembly. If shims are used during lock-off, include:
 - 4.1. Shim thickness
 - 4.2. Supporting calculations

You may start fabrication early by requesting an authorization of the fabrication plan portion before the complete shop drawings submittal is authorized. If the early fabrication plan is authorized, you are fully responsible for any changes that may occur after starting fabrication.

46-1.01C(2)(d) Construction Plan

Construction plan must include:

- 1. Methods of excavation for the staged lifts and types of excavation equipment.
- 2. Details for measuring the movement of the excavated face and the wall during stability testing and construction.
- 3. Measures to ensure wall and slope stability during construction.
- 4. Details for providing the bonded and unbonded length. If packers or other similar devices are used, include the type.
- 5. For soil nails, details for isolating installed proof test soil nails during shotcrete application.
- 6. Dewatering plan to divert, control, and dispose of surface and groundwater during construction
- 7. Drilling methods and equipment, including:
 - 7.1. Size of drilled hole
 - 7.2. Space requirements
- 8. Grout mix design and testing procedures.
- 9. Grout placement equipment and procedures, including minimum required cure time.
- 10. Testing equipment including method and equipment for measuring movement during testing.
- 11. For soil nails, include procedure for extracting grouted soil nails.

Replace section 46-1.01C(3) with:

04-16-21

46-1.01C(3) Test Data

Submit each ground anchor and soil nail test data in both electronic and hard copy format by noon the following working day after testing is complete.

For each test include:

10-15-21

- 1. Supervisory personnel, subcontractors, and personnel performing the test

04-16-21

- 2. Test loading equipment
- 3. Ground anchor and soil nail identification number, location, and test type
- 4. Time and date of:
 - 4.1. Drilling
 - 4.2. Installation
 - 4.3. Grouting
 - 4.4. Testing
- 5. Hole diameter and depth
- 6. Drilling method
- 7. Soil or rock classification and description

8. Bonded and unbonded length
9. Quantity of groundwater encountered within the bonded length
10. Grout quantity and pressure used within the bonded length
11. Anchor end or nail head movement at each load increment or at each time increment during the load hold period
12. Digital photo logs of extracted test ground anchors and soil nails

For electronic format of test data, compile test data using the Quail software provided by the Department. For each wall, email the latest accumulated test data in XML format generated by Quail to Geotechnical.Data@dot.ca.gov and the Engineer. Include the contract number and the Department's structure number of the wall in the subject line of the email.

Replace *Not Used* in section 46-1.01D(1) with:

Welding must comply with AWS D1.1.

10-19-18

Replace the introductory clause in the 1st paragraph of section 46-1.03A with:

Water or grout from ground anchor and soil nail construction must not:

04-16-21

Add to the end of section 46-1.03A:

Shotcrete must comply with section 53-2.

10-19-18

Delete the 3rd paragraph of section 46-1.03B.

10-19-18

Replace the 1st paragraph of section 46-1.03C with:

Before you insert each ground anchor and soil nail into a drilled hole, clean the anchor or nail of oil, grease, dirt, and other extraneous substances and repair or replace any damaged sheathing.

04-16-21

Use centralizers to position the ground anchor and soil nail in the center of the drilled hole. The diameter of the centralizers must be no more than (1) 0.5-inch smaller than the diameter of the drilled hole, or (2) 0.25-inch smaller than the inside diameter of casing, if casing is used.

Add to the end of section 46-2.01C:

If a pullout failure occurs, submit the pullout failure load as part of the test data.

04-16-21

Replace the 3rd paragraph of section 46-2.01D(2)(b)(i) with:

Do not stress against the concrete until it has attained a compressive strength of at least 2,880 psi and has cured for at least 7 days.

04-16-21

Replace the note for the table in the 1st paragraph of section 46-2.01D(2)(b)(ii) with:

10-15-21

NOTES:

FTL = Factored test load shown

AL = Alignment load = 0.10FTL

^aMaximum test load

Replace section 46-2.01D(3)(b)(i) with:

04-16-21

46-2.01D(3)(b)(i) General

Incrementally load the ground anchor until the maximum test load is held for the specified duration or a pullout failure occurs. If a pullout failure occurs, record the pullout failure load.

Add to the list in the 1st paragraph of section 46-2.01D(3)(b)(ii):

04-16-21

3. Pullout failure does not occur.

Replace the 1st paragraph of 46-2.02B with:

04-17-20

Strand tendons, bar tendons, and bar couplers must comply with section 50-1.02B and must be on the Authorized Material List for post-tensioning systems.

Replace the 1st sentence in the 2nd paragraph of section 46-2.02B with:

10-19-18

The anchorage enclosure and the steel tube and bearing plate of the anchorage assembly must be galvanized steel and comply with sections 55-1.02D(1) and 55-1.02E(1).

Replace item 9 in the list in the 3rd paragraph of section 46-2.02D with:

10-19-18

9. Have the physical properties shown in Table 4.1 of *Recommendations for Prestressed Rock and Soil Anchors* published by the Post-Tensioning Institute

Replace the 11th paragraph of section 46-2.03A with:

04-16-21

Space centralizers at 5-foot maximum intervals for the full length of the tendon, with the uppermost centralizer located less than 2 feet from the end of the steel tube and the deepest centralizer located 2 feet from the end of the anchor.

Replace the 1st paragraph of section 46-2.03C with:

04-16-21

Use spacers to separate individual strands of strand tendons within both the bonded and unbonded lengths so that the entire surface of each strand is bonded in the grout in the bonded length and each sheathed strand is surrounded by grout in the unbonded length. The spacers must be:

1. Spaced at 5 feet maximum
2. Less than 2 feet from the ends of the strand tendon
3. Made of plastic

4. Strong enough to support the individual strands during construction

Replace the 4th paragraph of section 46-2.03D with:

10-19-18

Immediately after lock-off, perform a lift-off test to verify that the lock-off load has been attained. The lift-off load must be within 10 percent of the specified lock-off load. If necessary adjust the shim thickness to achieve the lock-off load. If the load is not within 10 percent of the specified lock-off load, the anchorage must be reset and another lift-off load reading must be made. Repeat the process until the specified lock-off load is obtained.

Replace the 2nd paragraph of section 46-3.01A with:

10-19-18

A soil nail consists of a solid steel bar with an anchorage assembly that is placed in a drilled hole and then grouted.

Replace the 2nd and 3rd paragraphs of section 46-3.01C(1) with:

10-15-21

If production soil nails are rejected under section 46-3.01D(2)(b)(ii)(C), submit revised shop drawings.

If additional verification soil nails are required under section 46-3.01D(2)(b)(ii)(B), submit revised shop drawings.

Replace the 1st paragraph of section 46-3.01C(2) with:

10-15-21

If additional verification soil nails are required under section 46-3.01D(2)(b)(ii)(B), submit a test boring report for the additional verification soil nails.

Replace section 46-3.01D(2)(b)(ii)(1) with:

04-16-21

46-3.01D(2)(b)(ii)(A) General

10-19-18

Determine the test load using the following equation:

$$T = Lb \times Qb$$

where:

T = test load, pounds

04-16-21

Lb = soil nail bonded length, feet, 10 feet minimum for proof test; 8 feet minimum for verification test

10-19-18

Qb = test load per unit length of bond, pounds/foot

Replace the heading of section 46-3.01D(2)(b)(ii)(2) with:

04-16-21

46-3.01D(2)(b)(ii)(B) Verification Test

Replace the 1st through 3rd paragraphs of section 46-3.01D(2)(b)(ii)(2) with:

04-16-21

Perform verification testing in the Engineer's presence.

Install and test 2 verification test soil nails (1) for each wall zone, or (2) when you change equipment or method of drilling or grouting. You may install and test the nails during stability testing.

Conduct the verification test as follows:

1. Incrementally load the test soil nail as shown in the following table:

Verification Test Loading Schedule

Load increment	Hold time (minutes)
AL	Until stable
0.20T	1-2
0.40T	1-2
0.60T	1-2
0.80T ^a	60
1.00T ^{b,c}	10
AL	Until stable

10-15-21

NOTES:

T = Test load

AL = Alignment load = 0.10T

^aCreep test

^bAcceptance test load for verification test

^cMaximum test load for verification test

04-16-21

2. Apply each load increment in less than 1 minute and hold it for the length of time shown in the table titled "Verification Test Loading Schedule."
3. Measure and record the applied test load and the nail head movement at each load increment.
4. During the creep test:
 - 4.1. Hold the load constant for 60 minutes.
 - 4.2. Start the observation period for the load hold when the pump starts to apply the load increment from 0.60T to 0.80T.
 - 4.3. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, 10, 20, 30, 40, 50, and 60 minutes.
 - 4.4. Plot a creep curve as a function of the logarithm of time, showing the nail head movement from 6 to 60 minutes.
5. If the movement measured from 6 to 60 minutes is less than 0.08 inch:
 - 5.1. Increase the load incrementally to 1.00T.
 - 5.2. Hold the load constant for 10 minutes.
 - 5.3. Start the observation period for the load hold when the pump starts to apply the load increment from 0.80T to 1.00T.
 - 5.4. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, and 10 minutes.
 - 5.5. Reduce the load to the ending alignment load and record the residual movement.
6. If the movement measured from 6 to 60 minutes is 0.08 inch or greater, reduce the load to the ending alignment load.

Replace the 8th paragraph of section 46-3.01D(2)(b)(ii)(2) with:

04-19-19

If the Engineer revises soil nail lengths or test load per unit length of bond values, any additional verification test soil nails are change order work.

Replace section 46-3.01D(2)(b)(ii)(3) with:

04-16-21

46-3.01D(2)(b)(ii)(C) Proof Test

Perform proof testing in the Engineer's presence at the locations shown.

10-15-21

Production soil nails will be authorized when all the proof test soil nails within the same wall zone are authorized.

04-16-21

Test against a temporary yoke that bears directly on the shotcrete facing. Test loads transmitted through the temporary yoke must not fracture the shotcrete or cause displacement or sloughing of the soil surrounding the drilled hole.

Conduct the proof test as follows:

1. Incrementally load the test soil nail as shown in the following table:

Proof Test Loading Schedule

Load increment	Hold time (minutes)
AL	Until stable
0.20T	1-2
0.40T	1-2
0.60T	1-2
0.80T ^a	10 or 60
1.00T ^{b,c}	1-2
AL	Until stable

10-15-21

NOTES:

T = Test load

AL = Alignment load = 0.10T

^aCreep test

^bAcceptance test load for proof test

^cMaximum test load for proof test

04-16-21

2. Apply each load increment in less than 1 minute and hold it for the length of time shown in the table titled "Proof Test Loading Schedule."
3. Measure and record the applied test load and the nail head movement at each load increment.
4. During the creep test:
 - 4.1. Hold the load constant for 10 minutes.
 - 4.2. Start the observation period for the load hold when the pump starts to apply the load increment from 0.80T to 1.00T.
 - 4.3. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, and 10 minutes.
5. If the movement measured from 1 to 10 minutes is greater than 0.08 inch:
 - 5.1. Hold the load constant for an additional 50 minutes.
 - 5.2. Measure and record the nail head movement at 20, 30, 40, 50, and 60 minutes.
 - 5.3. Plot a creep curve as a function of the logarithm of time, showing the nail head movement from 6 to 60 minutes.
6. Reduce the load to the ending alignment load and record the residual movement.

Production soil nails represented by proof test soil nails that fail to comply with the acceptance criteria are rejected.

Submit revised shop drawings for replacement soil nails that show alternative installation methods, revised production soil nails, or a modified soil nail plan.

10-15-21

Delete section 46-3.01D(2)(b)(ii)(4).

Replace section 46-3.02A with:

04-19-19

46-3.02A General

Each production soil nail must be either a solid steel bar encapsulated full length in a grouted corrugated plastic sheathing or an epoxy-coated prefabricated solid steel bar partially encapsulated in a grouted corrugated plastic sheathing as shown.

Epoxy-coated prefabricated solid steel bars must comply with the specifications for epoxy-coated prefabricated reinforcement in section 52-2.03, except the average coating thickness after curing must be from 10 to 15 mils.

Solid steel bar for test soil nails is not required to be epoxy coated or encapsulated in grouted plastic sheathing.

Replace the heading of section 46-3.02B with:

10-19-18

46-3.02B Anchorage Assemblies

Replace the 2nd paragraph of section 46-3.02B with:

10-16-20

Concrete anchors on bearing plates must comply with the specifications for studs in clause 9 of AWS D1.1.

Replace section 46-3.02C with:

10-19-18

46-3.02C Solid Steel Bars

Solid steel bars must be either:

1. Threaded bars with spirally-deformed, ribbed threads continuous along the entire length of the bar.
2. Deformed reinforcing bars with at least a 6-inch length of thread cut into the bar on the anchorage end. Use coarse threading and the next larger reinforcing bar size.

Solid steel bars must comply with ASTM A615/A615M or A706/A706M, Grade 60 or ASTM A615/A615M, Grade 75.

Splicing must be authorized.

Epoxy coating at the anchorage end of epoxy-coated bars may be omitted for a maximum of 6 inches. Metal surfaces of assembled splices of epoxy-coated bars must be epoxy coated.

Choose the solid steel bar size and grade for test soil nails. Test soil nail bars must not be smaller than the production soil nails they represent.

Replace the 1st paragraph of section 46-3.03A with:

10-19-18

Determine the drilled-hole diameter and installation method required to achieve the test load per unit length of bond values shown.

1. Description of the progress of the jacking and adjustment activities
2. Description and evaluation of the condition of the temporary structure and supported structure
3. Inspection findings and the certifications listed in section 48-1.01D(2) that are completed by the temporary-structure engineer

48-1.01C(3) Adjustment Plan Shop Drawings

Submit adjustment plan shop drawings if the falsework or temporary supports are to be adjusted more than 1/2 inch.

The adjustment plan shop drawings and calculations must be sealed and signed by the temporary-structure engineer.

Adjustment plan shop drawings and calculations must include:

1. Methods and sequencing for the adjustment.
2. Descriptions of equipment to be used.
3. Location of jacks or other adjustment equipment.
4. Detailed sequence for releasing of bracing.
5. Details and calculations for the stability and adjustment of the falsework or temporary supports during all stages of the adjustment including any additional required temporary bracing.
6. Calculations that include stresses, deflections, and loads in all load carrying members, bracing, and equipment as well as any redistributed loads resulting from the adjustment. Calculations must also include the effect of the adjustment sequence.

48-1.01D Quality Assurance

48-1.01D(1) General

Reserved

48-1.01D(2) Temporary-Structure Engineer

The temporary-structure engineer must:

1. Be registered as a civil engineer in the State.
2. Have experience in temporary structure design or temporary structure construction inspection.
3. Seal and sign the shop drawings.
4. Be present during all jacking and adjustment activities.
5. Prepare, seal, and sign a daily temporary-structure inspection report during jacking and temporary-structure adjustment activities.
6. The temporary-structure engineer must inspect and certify that:
 - 6.1. Temporary structure is stable before jacking activities or adjustments and before concrete is placed.
 - 6.2. Temporary structure complies with the authorized shop drawings.
 - 6.3. Materials and workmanship are satisfactory for the work.
7. Stop activity if any unanticipated issues occur.
8. Propose revisions to the authorized shop drawings to address any issues. Do not resume temporary structure activities until the proposed revisions are authorized.

The temporary-structure engineer may assign a representative to perform the temporary structure activities specified in section 48-1.01D. The temporary-structure engineer must submit a letter that is sealed and signed certifying that the representative:

1. Is registered as a civil engineer in the State
2. Has experience in temporary structure design or temporary structure construction inspection
3. Is familiar with the authorized shop drawings and the stresses the members are required to sustain
4. Will attend at least 1 job site visit with the Engineer and your temporary-structure superintendent to discuss the authorized shop drawings

Add to list in the 2nd paragraph of section 48-2.01A:

04-17-20

5. Includes illumination for vehicular and pedestrian traffic

Add to the end of section 48-2.01A:

04-17-20

Falsework used as temporary supports must comply with section 48-3.

Replace section 48-2.01B with:

04-17-20

48-2.01B Definitions

independent support system: Support system that is in addition to a falsework removal system that employs methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes.

falsework release: Lowering of falsework to the point that it no longer supports the loads imposed by the permanent structure, or any element, that the falsework was designed to support during construction. Falsework release includes blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

falsework removal: Releasing, lowering, and disposing of the falsework.

Add between the 1st and 2nd paragraphs of section 48-2.01C(1):

10-16-20

Submit a certificate of compliance for the timber used to construct falsework. The certificate of compliance must verify the grade and species of the timber.

Replace the last paragraph of section 48-2.01C(1) with:

04-17-20

Submit a falsework lighting plan at least 10 days before starting construction on falsework containing openings for vehicular traffic, pedestrians, or railroad.

The plan must include:

1. Location, spacing, and mounting heights of luminaires
2. Types of luminaires
3. Calculations of illumination levels used to determine placement of luminaries
4. Plot of illumination points used to demonstrate compliance with the illumination levels requirements
5. Lighting circuit diagrams

Replace section 48-2.01C(2) with:

04-17-20

48-2.01C(2) Shop Drawings

Submit shop drawings and calculations for falsework.

The falsework shop drawings and calculations must be sealed and signed by the temporary-structure engineer for any of the following conditions:

1. Height of any portion of the falsework measured from the ground line to the soffit of the superstructure is more than 14 feet

2. Any individual falsework clear span is more than 16 feet
3. Falsework contains openings for vehicular, pedestrian, or railroad traffic
4. Falsework removal systems support falsework from above by winches, hydraulic jacks with prestressing steel, HS rods or cranes

10-16-20

Shop drawings and calculations for falsework piles with a calculated nominal resistance greater than 100 tons must be sealed and signed by an engineer who is registered as a civil or geotechnical engineer in the State.

04-17-20

Falsework shop drawings and calculations must include:

1. Details of erection and removal activities.
2. Methods and sequences of erection and removal, including equipment.
3. Maximum falsework adjustment height.
4. Details for the stability of falsework during all stages of erection and removal activities.
5. Superstructure placing diagram showing concrete placing sequence and construction joint locations. If a schedule for placing concrete is shown, no deviation is allowed.
6. Assumed soil bearing values for falsework footings.
7. Maximum horizontal distance falsework piles may be pulled for placement under caps.
8. Maximum deviation of falsework piles from vertical.
9. Anticipated total falsework and formwork settlements, including footing settlement and joint take-up.
10. Grade, species, and type of any timber or structural composite lumber. Include manufacturer's tabulated working stress values for composite lumber.
11. Design calculations that include stresses and deflections in load carrying members.
12. Provisions for complying with temporary bracing requirements.
13. Welding standard used for welded members, including previously welded splices.
14. The following information for falsework removal systems employing methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes:
 - 14.1. Design code used for the analysis of the structural members of the independent support system
 - 14.2. Provisions for complying with current Cal/OSHA requirements
 - 14.3. Load tests and ratings within 1 year of intended use of hydraulic jacks and winches
 - 14.4. Location of the winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes
 - 14.5. Analysis showing that the bridge deck and overhang are capable of supporting all loads at all time
 - 14.6. Analysis showing that winches will not overturn or slide during all stages of loading
 - 14.7. Location of deck and soffit openings if openings are needed
 - 14.8. Details of repair for the deck and soffit openings after falsework removal

Submit separate falsework shop drawings and calculations for each:

1. Single bridge or portion of bridge
2. Frame for multi-frame bridges

Add to section 48-2.01D:

04-17-20

48-2.01D(3) Falsework Lighting

After the installation of falsework lighting, measure the illumination levels in the presence of the Engineer, during the hours of darkness. For pavement and pedestrian walkway lighting, the measurements must be taken at ground level with the meter sensor pointing upward. For portal lighting, measurements must be taken at the face of the surface areas specified with the meter sensor perpendicular to the surface areas.

Falsework lighting must comply with the illumination levels shown in the following table:

Illumination Levels

Illumination Area	Average Illuminance (fc) (E_{avg})	Uniformity (E_{avg}/E_{min})
Pavement	0.6	4.0
Portal	1.0	4.0
Pedestrian Walkway	2.0	4.0

Replace the 1st paragraph of section 48-2.01D(2) with:

04-17-20

Except for previously welded splices, welding must comply with AWS D1.1. Welding of bar reinforcement must comply with AWS D1.4.

Replace the 2nd paragraph of section 48-2.01D(2) with:

10-16-20

Perform NDT on welded splices using UT or RT. Each weld and any repair made to a previously welded splice must be tested. You must select locations for testing. The length of a splice weld where NDT is to be performed must be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass must be ground smooth at test locations. Acceptance criteria must comply with the specifications for cyclically loaded nontubular connections subject to tensile stress in clause 8 of AWS D1.1. If repairs are required in a portion of the weld, perform additional NDT on the repaired sections. The NDT method chosen must be used for an entire splice evaluation, including any repairs.

Replace *Reserved* in section 48-2.02A with:

04-17-20

Wood must comply with the NDS. Timber used for falsework construction must be seasoned with moisture content not to exceed 19 percent.

Add to the end of section 48-2.02B(1):

04-17-20

Where falsework for multiple level bridges is supported on the deck of a structure:

1. Falsework must bear directly on either:
 - 1.1. Girder stems, bent caps, or end diaphragms of the supporting structure.
 - 1.2. Falsework sills that transmit the load to the girder stems, bent caps, or end diaphragms without applying any stress to the deck slab.
2. Additional falsework must be in place beneath the supporting structure when construction loads are imposed on the supporting structure. Design and construct additional falsework to support all construction loads imposed on the supporting structure from the upper structure.

Design the falsework lighting, for pavement, portals, and pedestrian walkways at or under falsework openings, to illuminate:

1. Falsework portals during the hours of darkness
2. Pavement, with portals less than 150 feet apart, during the hours of darkness
3. Pavement, with portals 150 feet or more apart, 24 hours a day
4. Pedestrian walkways 24 hours a day

Lighting branch circuits must not exceed 20 A.

Replace the 2nd sentence in the 1st paragraph of section 48-2.02B(2) with:

04-17-20

The minimum total design load for any falsework for combined live and dead load is 100 psf, including members that support walkways.

Replace the 4th paragraph of section 48-2.02B(2) with:

10-19-18

The assumed horizontal load the falsework bracing system must resist must be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and a wind loading. The assumed horizontal load in any direction must be at least 2 percent of the total dead load.

Replace the table in the 7th paragraph of section 48-2.02B(2) with:

04-17-20

Height zone, H (feet above ground)	Wind pressure value	
	Shores or columns adjacent to traffic (psf)	At other locations (psf)
H≤30	20	15
30<H≤50	25	20
50<H≤100	30	25
H>100	35	30

Replace the table in the 8th paragraph of section 48-2.02B(2) with:

04-17-20

Height zone, H (feet above ground)	Wind pressure value	
	For members over and bents adjacent to traffic opening (psf)	At other locations (psf)
H≤30	2.0 Q	1.5 Q
30<H≤50	2.5 Q	2.0 Q
50<H≤100	3.0 Q	2.5 Q
H>100	3.5 Q	3.0 Q

NOTE:

$$Q = 1 + 0.2W, \text{ but not more than } 10$$

where:

W = width of the falsework system in feet, measured in the direction of the wind force

Add to the end of section 48-2.02B(3)(a):

10-15-21

Deflection due to reinforced concrete loading only must not exceed 1/240 of the span length.

Replace section 48-2.02B(3)(b) with:

10-15-21

48-2.02B(3)(b) Timber

Design stresses for timber and timber connections must not exceed stresses specified in the current NDS.

Adjustment factors used to determine allowable stresses for timber members and connections must comply with NDS for the appropriate condition of use and species.

Pile design load for timber piles must not exceed 45 tons.

Replace the 1st and 2nd paragraphs of section 48-2.02B(3)(c) with:

04-17-20

Except for flexural compressive stresses, the design load for identified grades of steel must not exceed the allowable strength specified in the AISC *Steel Construction Manual*.

Except for flexural compressive stresses, the design load for unidentified steel must not exceed the allowable strength specified for steel complying with ASTM A36/A36M in the AISC *Steel Construction Manual* or as shown in the following table:

Quality characteristic	Requirement
Tension, axial and flexural (psi)	22,000
Compression, axial (psi)	$16,000 - 0.38(L/r)^{2a}$
Shear on gross section of web of rolled shapes (psi)	14,500
Web yielding for rolled shapes (psi)	27,000
Modulus of elasticity (E) (psi)	30×10^6

NOTES:

L = unsupported length, inches

r = radius of gyration of the member, inches

^a L/r must not exceed 120

Replace the table in the 3rd paragraph of section 48-2.02B(3)(c) with:

10-15-21

Quality characteristic	Requirement
Compression, flexural (psi)	$12,000,000/[(L \times d)/(b \times t)]^a$
Modulus of elasticity (E) (psi)	30×10^6

NOTES:

L = unsupported length, inches

d = least dimension of rectangular columns or the width of a square of equivalent cross-sectional area for round columns, or the depth of beams, inches

b = width of the compression flange, inches

t = thickness of the compression flange, inches

F_y = specified minimum yield stress in psi

^aNot to exceed (1) 22,000 psi for unidentified steel, (2) 22,000 psi for steel complying with ASTM A36/A36M, or (3) $0.6F_y$ for other identified steel

Replace item 6 in the list in the 3rd paragraph of section 48-2.02B(4) with:

10-15-21

- Falsework member minimum clear area width must comply with section 12-3.20C(1) and the requirements specified in the following table:

Minimum Clear Area Width

Falsework member	To permanent railing members and barriers
Footings	0'-3"
Piles	2'-6"
Other members	2'-6"

Add to section 48-2.02:

04-17-20

48-2.02C Falsework Lighting

48-2.02C(1) General

A falsework luminaire must:

1. Be commercially available
2. Include brackets and locking screws

48-2.02C(2) Pavement Illumination

Not Used

48-2.02C(3) Portal Illumination

Portal illumination includes plywood clearance guides 4 feet wide by 8 feet high and luminaires.

48-2.02C(4) Pedestrian Walkway Illumination

Not Used

Delete the 3rd paragraph of section 48-2.03A.

04-17-20

Add to section 48-2.03A:

04-17-20

During concrete placement, if (1) events occur that the Engineer determines will result in a structure that does not comply with the structure as described or (2) settlement variance is greater than 3/8-inch from the values shown on shop drawings, stop concrete placement and apply corrective measures. If the measures are not provided before initial concrete set occurs, stop concrete placement at the location ordered.

Detour traffic from the lanes over which falsework is being erected, released, adjusted, or removed.

Replace the 3rd paragraph of the section 48-2.03B with:

04-17-20

Falsework piles must be driven and assessed under section 49. The actual nominal driving resistance must be at least twice the falsework pile design load. For pile acceptance, the required number of hammer blows in the last foot of driving is determined using the formula in 49-2.01A(4)(c).

Add between the 2nd and 3rd paragraphs of section 48-2.03C:

10-19-18

Falsework erection includes adjustments or removal of components that contribute to the horizontal stability of the falsework system.

Delete the 8th paragraph of section 48-2.03C.

04-17-20

Replace section 48-2.03D with:

04-17-20

48-2.03D Removal

Release and remove falsework such that portions of falsework to be removed remain stable.

Falsework release includes blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

Except for concrete above the deck, do not release falsework supporting any span of a:

1. Simple span bridge before 10 days after the last concrete has been placed
2. Continuous or rigid frame bridge before 10 days after the last concrete has been placed:
 - 2.1. In that span
 - 2.2. In adjacent portions of each adjoining span for a length equal to one-half of the span where falsework is to be released
3. Simple span, continuous, or rigid frame bridge until the supported concrete has attained a compressive strength of 2,880 psi or 80 percent of the specified strength, whichever is greater

Do not release falsework for prestressed portions of structures until prestressing steel has been tensioned.

Do not release falsework supporting any span of a continuous or rigid frame bridge until all required prestressing is complete (1) in that span and (2) in adjacent portions of each adjoining span for a length equal to at least one half of the span where falsework is to be released.

Release falsework supporting spans of CIP girders, slab bridges, or culverts before constructing or installing railings or barriers on the spans, unless authorized.

Release falsework for arch bridges uniformly and gradually. Start at the crown and work toward the springing. Release falsework for adjacent arch spans concurrently.

Do not release falsework that supports overhangs, deck slabs between girders, or girder stems that slope 45 degrees or more from vertical before 7 days after deck concrete has been placed.

You may release falsework supporting the sides of girder stems that slope less than 45 degrees from vertical before placing deck concrete if you install lateral supports. Lateral supports must be:

1. Designed to resist rotational forces on the girder stem, including forces due to concrete deck placement
2. Installed immediately after each form panel is removed
3. Installed before releasing supports for the adjacent form panel

Do not release falsework for bent caps supporting steel or PC concrete girders before 7 days after placing bent cap concrete.

Release falsework for structural members subject to bending as specified for simple span bridges.

Do not release falsework for box culverts and other structures with decks lower than the roadway pavement and span lengths of 14 feet or less until the last placed concrete has attained a compressive strength of 1,600 psi. Curing of the concrete must not be interrupted. Falsework release for other box culverts must comply with the specifications for the release of bridge falsework.

Do not release falsework for arch culverts sooner than 40 hours after concrete has been placed.

Remove falsework piling to at least 2 feet below the original ground or streambed. Remove falsework piling driven within ditch or channel excavation limits to at least 2 feet below the bottom and side slopes of the excavated areas.

Falsework removal systems employing methods of holding falsework by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes must also be supported by an independent support system when the falsework is over vehicular, pedestrian, or railroad traffic openings open to traffic.

Bridge deck and soffit openings used to facilitate falsework removal activities must:

1. Have a 6-inch maximum diameter opening.
2. Be located away from the wheel paths for deck openings.
3. Be formed with corrugated HDPE pipe complying with section 20-2.07B(3).

Before filling the bridge deck and soffit openings with concrete:

1. Trim HDPE pipes 1 inch from the exposed surface of the top of deck, bottom overhand, and soffit
2. Clean and roughen concrete surfaces of opening. Fill the opening with rapid setting concrete complying with section 60-3.02B(2) or with a concrete mix of equal or higher strength than the deck. Finish surface must comply with section 51-10.3F(2).

Falsework removal over roadways with a vertical traffic opening of less than 20 feet must start within 14 days after the falsework is eligible to be released and must be completed within 45 days after it is eligible to be released.

Replace section 48-2.03E with:

04-17-20

48-2.03E Falsework Lighting

48-2.03E(1) General

Notify the Engineer at least 5 business days before the installation of the falsework lighting.

Fasten power cables to the supporting structure at a minimum 3-foot intervals and within 12 inches from every box. Encase cables within 8 feet of the ground in a minimum 1/2-inch Type 1 conduit.

Enclose splices in junction boxes.

Provide power for the falsework lighting under section 87-20.

Energize lighting circuits immediately after supporting structures have been erected.

48-2.03E(2) Pavement Illumination

Provide pavement illumination on roadways beneath falsework structures.

Install luminaires:

1. Along the sides of the opening not more than 4 feet behind or 2 feet in front of the roadway face of the temporary barrier system

10-15-21

2. 12 to 16 feet above the roadway surface without obstructing the light pattern on the pavement
3. Aimed to avoid glare to motorists
4. Spaced to comply with the illumination levels table
5. At the ends no more than 10 feet inside portal faces

04-17-20

Measure the illumination levels at a minimum two points per lane, one on each side within one-quarter of the lane width from the lane stripe. Use this pattern to start the measurements at both ends of the falsework and then at 15-foot intervals through the length of the pavement under the falsework.

48-2.03E(3) Portal Illumination

Provide portal illumination on the sides facing traffic. Install luminaires and clearance guides immediately after falsework vertical members are erected.

Fasten clearance guides:

1. To the vertical support adjacent to the traveled way, facing traffic
2. Vertically with the bottom of the clearance guide from 3 to 4 feet above the roadway
3. With the center located approximately 3 feet horizontally behind the face of the temporary barrier system on the roadway side

10-15-21

Paint clearance guides before each installation with not less than 2 applications of flat white paint.

04-17-20

If ordered, repainting is change order work.

Install luminaires on the structure directly over the vertical support, approximately 16 feet above the pavement and 6 feet in front of the guides. Aim the luminaires to illuminate the exterior falsework beam, the clearance guides, and the overhead clearance sign and comply with the illumination levels table.

Measure the illumination levels at the center and four corners of the clearance guides, at the exterior falsework beam, and at the overhead clearance sign.

48-2.03E(4) Pedestrian Walkway Illumination

Provide pedestrian walkway illumination immediately after the protective overhead covering is erected.

Install the luminaires a minimum 8 feet clearance in the protective overhead covering and center them over the pedestrian walkway. Space the luminaires through the pedestrian walkway as needed to comply with the illumination levels table. Install luminaires at the ends no more than 7 feet inside the pedestrian walkway openings.

Measure the illumination levels at a minimum two points, one on each side within one-quarter of the walkway width from the edge. Use this pattern to start the measurements at both ends of the falsework and then at 10-foot intervals through the length of the pedestrian walkway.

Replace section 48-3.01A with:

10-16-20

48-3.01A Summary

Section 48-3 includes specifications for providing temporary supports for structures during retrofit, reconstruction, erection, and removal activities.

Jacking assemblies, accessories, and activities required to jack and support structures must comply with section 48-5.

Falsework must comply with section 48-2.

Replace section 48-3.01B with:

10-16-20

48-3.01B Definitions

Reserved

Replace the 2nd paragraph of section 48-3.01C(1) with:

10-16-20

Submit a copy of the displacement monitoring record after completing the work.

Replace the 1st and 2nd paragraphs of section 48-3.01C(2) with:

10-16-20

Submit the following:

1. Descriptions and values of all loads, including construction equipment loads.
2. Descriptions of equipment to be used.
3. Details and calculations for jacking and supporting the structure.
4. Stress sheets, anchor bolt layouts, shop details, erection plans, and removal plans for the temporary supports.
5. Assumed soil bearing values and design stresses for temporary support footings, including anticipated foundation settlement.
6. Maximum distance temporary-support piles may be pulled for placement under footing caps.
7. Maximum deviation of temporary-support piles from a vertical line through the point of fixity.
8. Details for use of permanent piles. Include any additional loads imposed on the piles.
9. Details for additional bracing required during erection and removal of temporary supports.

10. Details of the displacement monitoring system, including equipment, location of control points, and methods and schedule for taking measurements.
11. Mitigation plan for jacking the structure if settlement occurs in the temporary supports.

Calculations must show a summary of computed stresses in (1) temporary supports, (2) connections between temporary supports and the structure, and (3) load-supporting members. The computed stresses must include the effect of the jacking sequence. Calculations must include a lateral stiffness assessment of the temporary support system.

10-19-18

Delete the 4th paragraph of section 48-3.01C(2).

Replace section 48-3.01D with:

10-16-20

48-3.01D Quality Assurance

48-3.01D(1) General

Welding, welder qualification, and welding inspection for temporary supports must comply with AWS D1.1.

48-3.01D(2) Quality Control

Reserved

Replace section 48-3.02B with:

04-17-20

48-3.02B Design Criteria

The Engineer does not authorize temporary support designs based on allowable stresses or design load greater than those specified in section 48-2.02B(3).

If falsework loads are imposed on temporary supports, the temporary supports must also satisfy the deflection criteria in section 48-2.02B(3).

The temporary support system must support the initial jacking loads and the minimum temporary support design loads and forces shown. As a minimum, the horizontal load to be resisted in any direction by the temporary support system must be (1) the sum of actual horizontal loads due to equipment, construction sequence, or other causes plus an allowance for wind and (2) not less than 5 percent of the total supported dead load at the location being considered. Adjust vertical design loads for the weight of the temporary supports and jacking system, construction equipment loads, and additional loads imposed by jacking activities. Construction equipment loads must be at least 20 psf of deck surface area of the frame involved.

10-16-20

For column repair or removal, the temporary supports must resist the described lateral design forces applied at the point where the column to be removed meets the superstructure. Stiffness of temporary supports must match the described minimum stiffness. If the temporary support stiffness exceeds the described minimum stiffness, increase the lateral design forces to be compatible with the temporary support lateral stiffness.

04-17-20

Place temporary supports, that are resisting transverse lateral loads, within 1/2 of the span length from the existing bent. Place temporary supports, that are resisting longitudinal lateral loads, within the frame where columns are to be removed.

You may use the permanent piles as part of the temporary support foundation. Do not move or adjust permanent piles from the locations shown. If you install permanent piles longer than described to support the temporary supports above the top of the footing and later cut off the piles at their final elevation, you must use shear devices adequate to transfer all pile reactions into the footing.

Design temporary support footings to carry the loads imposed without exceeding the estimated soil bearing values or anticipated settlements. You must determine soil bearing values.

Where temporary supports are placed on the deck of an existing structure:

1. Temporary supports must bear either:
 - 1.1. Directly on girder stems, bent caps, or end diaphragms of the supporting structure
 - 1.2. On falsework sills that transmit the load to the stems, bent cap, or end diaphragms without overstressing any member of the new or existing structure
2. Temporary supports must not induce permanent forces into the completed structure or produce cracking.
3. Place additional temporary supports beneath the existing structure where temporary support loads are imposed on the existing structure. Design and construct the additional temporary supports to support all loads from the upper structure and construction activities.

Provide additional bracing as required to withstand all imposed loads during each phase of temporary support erection and removal. Include wind loads complying with section 48-2.02B(2) in the design of additional bracing.

Mechanically connect (1) the structure to the temporary supports and (2) the temporary supports to their foundations. Mechanical connections must be capable of resisting the lateral design forces. Friction forces developed between the structure and temporary supports (1) are not considered an effective mechanical connection and (2) must not be used to reduce lateral forces.

Design mechanical connections to accommodate movement resulting from adjustments made to the temporary supports.

If the concrete is to be prestressed, design temporary supports to support changes to the loads caused by prestressing forces.

Temporary supports must comply with the specifications for falsework in section 48-2.02B(4).

Replace section 48-3.03 with:

10-16-20

48-3.03 CONSTRUCTION

Where described, install temporary crash cushion modules under section 12-3.22 before starting temporary support activities. Remove crash cushion modules when authorized.

Construct and remove temporary supports under the specifications for falsework in section 48-2.03.

If traffic is carried on the structure on temporary supports, do not release temporary supports until the supported concrete has attained 100 percent of the described strength.

Remove attachments from the existing structure. Restore concrete surfaces to original conditions except where permanent alterations are shown.

Replace section 48-4.01 with:

04-17-20

48-4.01 GENERAL

48-4.01A Summary

Section 48-4 includes specifications for temporary decking for joint or deck reconstruction.

Temporary decking must consist of a steel plate system that spans the incomplete work.

Concrete anchorage devices and nonskid surface must comply with section 75-3.

48-4.01B Definitions

Reserved

48-4.01C Submittals

Submit shop drawings and calculations for temporary decking.

Shop drawings and calculations for temporary decking must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Temporary decking shop drawings and calculations must include:

1. Storage location of equipment and materials that allows for 1 shift of work and placement of temporary decking within the time allowed
2. Construction sequence and schedule details
3. Cure time for concrete to be placed under temporary decking
4. Details for removing temporary decking and restoring the existing structure

If temporary decking is not shown, shop drawings and calculations must also include:

1. Design calculations, including the description, location, and value, of all loads
2. Details of the connection between the temporary decking and the existing or new structure

Submit a certificate of compliance for temporary decking materials.

Sections 48-1.01C(2), 48-1.01C(3), and 48-1.01D(2) do not apply for temporary decking.

48-4.01D Quality Assurance

Reserved

Replace *Not Used* in section 48-4.02 with:

04-17-20

48-4.02A General

Yield strength of steel plate must be greater than or equal to 36 ksi.

Bolts must comply with ASTM F3125, Grade A325.

Nuts must comply with ASTM A563/563M.

Material for temporary tapers must be rapid setting concrete or polyester concrete complying with section 60-3.02B(2) or 60-3.04B(2).

48-4.02B Design Criteria

If temporary decking is not shown, the temporary decking design must:

1. Comply with the unfactored permit loads, braking force, and HL93 loads except lane load from the current *AASHTO LRFD Bridge Design Specifications with California Amendments*.
2. Not exceed the allowable stresses or design loads specified in section 48-2.02B(3).
3. Have live load deflection not exceeding 1/300 of the temporary decking span for the design load.
4. Provide for temporary decking with a uniform surface with a coefficient of friction of at least 0.35 when measured under California Test 342.
5. Provide for temporary decking that is mechanically connected to the existing structure and adjacent approaches. If a steel plate spans a joint, the mechanical connection must accommodate at least 50 percent of the movement rating shown for that joint.
6. Not overstress, induce permanent forces into, or produce cracking in the existing structure.

Replace section 48-4.03 with:

04-17-20

48-4.03 CONSTRUCTION

For bolted connections, drill the holes without damaging the adjacent concrete. Do not damage existing reinforcement.

If the temporary decking does not extend the entire width of the roadway, taper the sides of the temporary decking at a 12:1 (horizontal: vertical) ratio.

Cure temporary tapers at least 3 hours before allowing traffic on the temporary decking.

If unanticipated displacements, cracking, or other damage occurs to the existing structure or to any new components installed in or adjacent to the deck, stop work on the deck and perform corrective measures.

Edges of steel plate systems must be in full contact with the existing deck and the adjacent approach slab. If used, shims must be securely attached to the plate.

Do not allow traffic on deck concrete until it has attained the compressive strength shown.

When temporary decking is no longer needed, immediately remove temporary decking materials and connections from the existing structure. Patch holes with rapid setting concrete complying with section 60-3.02. Remove modifications to the existing structure except where permanent alterations are shown.

Replace section 48-5 with:

10-16-20

48-5 JACKING

48-5.01 GENERAL

48-5.01A Summary

Section 48-5 includes specifications for jacking the bridge superstructure using a jacking support system.

48-5.01B Definitions

Reserved

48-5.01C Submittals

The submittal for shop drawings and calculations must include:

1. Descriptions, locations, and values of all loads, including construction equipment loads
2. Jacking construction sequence including staging areas for equipment and materials for jacking support systems
3. Type, model number, and weight of equipment to be used including:
 - 3.1. Jack capacity
 - 3.2. Certified calibration chart for each jack
 - 3.3. Certified indicator to determine jacking force
4. Details and calculations with the load paths for jacking and supporting the structure including a redundant system of supports to ensure stability of the jacking system during jacking activities
5. Stress sheets, anchor bolt layouts, shop drawing details, and erection and removal plans for the jacking support system
6. Assumed soil bearing values and design stresses for support footings, including anticipated foundation settlement
7. Details for bracing required during erection and removal
8. Details of the displacement monitoring system, including equipment, location of control points, and methods and schedule of taking measurements
9. Any additions or modifications to the structure in connection with the jacking support systems including:
 - 9.1. Temporary strengthening and stiffening members
 - 9.2. Permanent stiffening members
10. Mitigation plan for jacking the structure if settlement occurs

Calculations must show a summary of computed stresses in the jacking support system and the connections between the jacking support system and the bridge superstructure. The computed stresses must include the effect of the jacking sequence.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Submit the displacement monitoring records.

48-5.01D Quality Assurance

48-5.01D(1) General

Calibrate each jack within 6 months of use and after each repair. Each jack and its gauge must (1) be calibrated as a unit with the cylinder extension in the approximate position that it will be at the final jacking force and (2) accompanied by a certified calibration chart. Each load cell must be calibrated. Calibration must be performed by an authorized laboratory.

48-5.01D(2) Displacement Monitoring

04-16-21

Perform an initial survey to record the location of the structure before starting work. Monitor and record vertical and horizontal displacements of the jacking support system and the structure. Use vandal-resistant displacement monitoring equipment. Perform monitoring continuously during jacking activities. Make monitoring records available at the job site during normal work hours. Monitoring records must be sealed and signed by an engineer who is registered as a civil engineer in the State.

04-16-21

As a minimum, monitor the structure at the supported or jacking locations and at the midspan of both adjoining spans. Locate control points at each location near the center and at both edges of the superstructure. As a minimum, record elevations at the following times:

10-16-20

1. Before starting jacking activities
2. Immediately after completing jacking
3. After completing bridge removal
4. Before connecting the superstructure to the substructure
5. After removing the jacking support system

48-5.02 MATERIALS

48-5.02A General

Reserved

48-5.02B Design Criteria

The jacking support system must resist the structure dead load and lateral design forces shown, plus any additional loads from jacking equipment and activities. As a minimum, the horizontal load to be resisted in any direction for the jacking support system and temporary bracing must be (1) the sum of actual horizontal loads due to equipment, construction sequence, or other causes plus an allowance for wind as specified in section 48-2.02B(2) and (2) not less than 5 percent of the total dead load of the structure being jacked. If the jacking support system lateral stiffness exceeds the described minimum stiffness, increase the lateral design forces to be compatible with the jacking support system lateral stiffness.

Systems involving modifications to the bridge that impair the structural integrity, intended serviceability, or design capacity of the bridge are not allowed.

48-5.03 CONSTRUCTION

Equip each jack with a pressure gauge or load cell for determining the jacking force. Each pressure gauge must have an accurately reading dial at least 6 inches in diameter. Each load cell must be provided with an indicator to determine the jacking force.

Provide a redundant system of supports to ensure stability of the jacking system during jacking activities.

Stop jacking activities if unanticipated displacements, cracking, or other damage occurs. Corrective measures must be authorized and implemented before resuming jacking activities.

Before starting jacking activities at a location being supported, the jacking support system must (1) apply a force to the structure that is equal to the initial jacking load or the dead load shown and (2) hold that load until all initial compression and settlement of the system is completed.

During jacking activities, apply loads simultaneously. Control and monitor jacking operations to prevent distortion and stresses that would damage the structure. Maintain total vertical displacements at control points to less than 1/4 inch from elevations recorded before jacking or as authorized.

Jack the superstructure uniformly to the position described. Distribute the load uniformly across each hinge, abutment, bent, or span. If authorized, place galvanized shims as necessary to provide uniform loading at bearing pads.

After reconstruction activities, the monitored control points must not deviate by more than 1/4 inch from the initial vertical survey elevations or other authorized elevations.

Remove attachments required for jacking from the superstructure and apply the described finish to concrete surfaces.

48-5.04 PAYMENT

Not Used

Add to the end of section 48-6.01C(1):

Sections 48-1.01C(2), 48-1.01C(3), and 48-1.01D(2) do not apply for temporary wood poles.

04-17-20

Replace Reserved in section 48-6.01D(1) with:

A temporary-structure engineer is not required.

04-17-20

Delete the 3rd paragraph of section 48-6.02B.

04-17-20

Replace the 2nd and 3rd paragraphs of section 48-6.03A with:

Install a temporary barrier system at temporary wood pole locations that are less than 15 feet from the edge of a traffic lane.

10-15-21

Install temporary barrier system before erecting temporary wood poles. Do not remove temporary barrier system until authorized.

^^

49 PILING

04-15-22

Replace section 49-1.01B with:

04-16-21

49-1.01B Definitions

control zone: Zone where subsurface conditions are similar to the corresponding support location.

dry hole: Drilled hole that requires no work to keep it free of water.

dewatered hole: Drilled hole that:

1. Accumulates no more than 12 inches of water at the bottom during a 1-hour period without pumping from the hole
2. Has no more than 3 inches of water at the bottom immediately before placing concrete

3. Does not require temporary casing to control groundwater

nominal driving resistance: Sum of (1) nominal resistance required to resist the factored axial loads and (2) driving resistance from unsuitable, liquefiable, or scourable penetrated soil layers that do not contribute to the design resistance.

nominal resistance: Geotechnical resistance required to resist the factored axial loads.

Replace the 4th paragraph of section 49-1.01D(3) with:

04-16-21

Install load test piles with the same equipment to be used for installation of production piles.

Replace the 6th paragraph of section 49-1.01D(4) with:

10-19-18

Except for load test piles and anchor piles, drive the 1st production pile in the control zone. Do not install any additional production piles until dynamic monitoring has been performed, and the Engineer provides you with the bearing acceptance criteria curves for any piles represented by the dynamically monitored piles.

Add to the end of section 49-1.03:

04-16-21

For a mechanically stabilized embankment abutment, drive or install the piles before constructing the mechanically stabilized embankment around the piles. Mechanically stabilized embankment reinforcement must maintain a 6-inch clearance around the piles.

Replace the 3rd paragraph of section 49-2.01D with:

10-19-18

The payment quantity for furnish piling is the length measured along the longest side of the pile from the specified tip elevation shown to the plane of pile cutoff, except for dynamically monitored piles. For dynamically monitored piles, the payment quantity for furnish piling includes an additional length of 2 times the largest cross-sectional dimension of the pile plus 2 feet.

Add to the end of section 49-2.02A(2):

10-19-18

longitudinal weld length: The length of a continuous longitudinal weld.

circumferential weld length: The length of a continuous weld around the circumference of the pipe pile.

spiral weld length: The length of one full 360-degree spiral weld revolution around the circumference of the pipe pile.

Replace the 3rd paragraph of section 49-2.02A(4)(b)(iii)(B) with:

10-19-18

For welding performed under AWS D1.1:

1. Perform NDT on 25 percent of each longitudinal, circumferential, or spiral weld length using RT or UT.
2. If repairs are required in a portion of the tested weld:

- 2.1. Perform additional NDT on untested areas on each end of the initial portion tested. The length of additional NDT on each end must equal 10 percent of the weld length. If it is not possible to perform 10 percent of the weld length on one end, perform the remaining percentage on the other end.
- 2.2. After this additional 20 percent of NDT is performed, determine and record the total cumulative repair lengths from all NDT for each weld length. If the cumulative weld repair length is equal to or more than 10 percent of the weld length, then perform NDT on the entire weld length.
- 2.3. Perform NDT on the repaired portion plus 2 inches on each end of the repaired weld excavation.

Replace the 2nd paragraph of section 49-2.02A(4)(b)(iii)(C) with:

10-19-18

Perform NDT on 25 percent of the weld length performed by each welder, using RT or UT at locations selected by the Engineer. The Engineer may select several locations on a given splice. The cover pass must be ground smooth at locations to be tested.

Replace the 4th paragraph of section 49-2.02A(4)(b)(iii)(C) with:

10-19-18

If repairs are required in a portion of the tested weld:

1. Perform additional NDT on untested areas on each end of the initial portion tested. The length of additional NDT on each end must equal 10 percent of the pipe's outside circumference. If it is not possible to perform 10 percent of the weld length on one end, perform the remaining percentage on the other end.
2. After this additional 20 percent of NDT is performed, determine and record the total cumulative repair lengths from all NDT for each weld length. If the cumulative weld repair length is equal to or more than 10 percent of the pipe's outside circumference, then perform NDT on the entire weld length.
3. Perform NDT on the repaired portion plus 2 inches on each end of the repaired weld excavation.

Replace the 5th paragraph of section 49-2.02B(1)(a) with:

10-16-20

For welding and prequalifying base metal under Table 5.3 of AWS D1.1, treat steel pipe piles complying with ASTM A252 as either ASTM A572/572M, Grade 50, or ASTM A709/709M, Grade 50.

Replace the 7th paragraph of section 49-2.02B(1)(a) with:

10-16-20

For groove welds using submerged arc welding from both sides without backgouging, qualify the WPS under Table 6.5 of AWS D1.

Replace the 5th paragraph of section 49-2.02B(1)(b) with:

10-16-20

If splicing steel pipe piles using a circumferential weld, the piles must comply with the fit-up requirements of clause 10.23.1 of AWS D1.1.

Replace *clause 4.9.4* in item 2.3 in the list in the 2nd paragraph of section 49-2.02B(2) with:

10-16-20

Clause 6.10.4

Replace section 49-2.05A with:

10-15-21

49-2.05A General

Section 49-2.05 includes specifications for furnishing and installing permanent steel sheet piles.

Replace section 49-3.01B(2) with:

04-19-19

49-3.01B(2) Mass Concrete

Section 49-3.01B(2) applies to CIP concrete piles with a diameter greater than 8 feet.

For piles with a diameter greater than 8 feet and less than or equal to 14 feet:

1. The specifications for SCM content in the 4th paragraph of section 90-1.02B(3) do not apply.
2. The SCM content of the concrete must comply with the following:
 - 2.1. Any combination of portland cement or portland limestone cement and fly ash satisfying:

10-15-21

Equation 1:

$$(12 \times FM)/MC \geq X$$

where:

FM = fly ash complying with AASHTO M 295, Class F, with a CaO content of up to 10 percent, including the quantity in blended cement, lb/cu yd

MC = minimum quantity of cementitious material specified, lb/cu yd

X = 3.0 for $8 < D \leq 10$, where *D* = pile diameter in feet

X = 4.0 for $10 < D \leq 14$, where *D* = pile diameter in feet

Equation 2:

$$MC - MSCM - PC \geq 0$$

where:

MC = minimum quantity of cementitious material specified, lb/cu yd

MSCM = minimum sum of SCMs that satisfies equation 1, lb/cu yd

PC = quantity of Type IL cement or portland cement, including the quantity in blended cement, lb/cu yd

- 2.2. You may replace any portion of the cement with any SCM complying with section 90-1.02B(3) if equations 1 and 2 are satisfied as specified above.

04-19-19

For piles with a diameter greater than 14 feet, the concrete must comply with the specifications for mass concrete in section 51-6.

Replace section 49-3.02A(2) with:

10-15-21

49-3.02A(2) Definitions

Reserved

Replace the introductory clause in the 2nd paragraph of section 49-3.02A(3)(b) with:

04-16-21

For concrete placed under slurry, submit the additional information:

Replace item 3 in the list in the 2nd paragraph of section 49-3.02A(3)(g) with:

04-16-21

3. Step by step description of the mitigation work to be performed, including drawings if necessary. If the *ADSC Standard Mitigation Plan* is an acceptable mitigation method, include the most recent version. For the most recent Department-published version of *ADSC Standard Mitigation Plan*, go to the Authorized ADSC Standard Mitigation Plan website.

Replace the 3rd sentence in the 1st paragraph of section 49-3.02A(3)(h) with:

04-16-21

The mitigation report must be sealed and signed by an engineer who is registered as a civil engineer in the State, except for mitigation performed under the current Department-published version of *ADSC Standard Mitigation Plan 'A' – Basic Repair*.

Replace the 7th paragraph of section 49-3.02A(4)(d)(iii) with:

04-16-21

If a rejected pile requires mitigation, the Department withholds 30 percent of the contract item price of the rejected pile. The Department returns the withholding upon compliance with sections 49-3.02A(3)(h) and 49-3.02A(4)(d).

Replace the 1st paragraph of section 49-3.02B(2) with:

10-15-21

Concrete placed under slurry must:

1. Contain at least 675 pounds of cementitious material per cubic yard.
2. Have a slump of 7 to 9 inches. The nominal and maximum slump and penetration specifications in section 90-1.02G(6) do not apply.

Replace the paragraph in section 49-3.02B(3) with:

10-15-21

For concrete placed under slurry, the combined aggregate gradation must comply with the 1/2-inch or 3/8-inch maximum gradation specified in section 90-1.02C(4)(d).

Add to the end of section 49-3.02C(1):

04-19-19

You may construct CIDH concrete piles 24 inches in diameter or larger by excavating and depositing concrete under slurry.

Replace section 49-3.02C(5) with:

04-15-22

49-3.02C(5) Vertical Inspection Pipes

For acceptance testing, install and test vertical inspection pipes as follows:

1. Log the elevations of the inspection pipe couplers and pile reinforcing cage couplers.
2. Cap each inspection pipe at the bottom. Extend the pipe from 3 feet above the pile cutoff to the bottom of the reinforcing cage. Provide a temporary top cap or similar means to keep the pipes clean before testing. If pile cutoff is below the ground surface or working platform, extend inspection pipes

- to 3 feet above the ground surface or working platform. Log the elevation of the top of inspection pipes.
3. If any changes are made to the pile tip, extend the inspection pipes to the bottom of the reinforcing cage.
 4. Install inspection pipes in a straight alignment and parallel to the main reinforcement. Securely fasten inspection pipes in place and provide protective measures to prevent misalignment or damage to the inspection pipes during installation of the reinforcement and placement of concrete in the hole. Construct CIDH concrete piles such that the relative distance of inspection pipes to vertical steel reinforcement remains constant.
 5. After concrete placement is complete, fill inspection pipes with water to prevent debonding of the pipe.
 6. Provide safe access to the tops of the inspection pipes.
 7. After placing concrete and before requesting acceptance testing, test each inspection pipe in the Engineer's presence by passing a rigid cylinder through the length of pipe. The rigid cylinder must:
 - 7.1. Be 1-1/4-inch diameter by 4.5-foot long.
 - 7.2. Weigh 12 pounds or less.
 - 7.3. Be able to freely pass down through the entire length of the pipe under its own weight and without the application of force.
 8. When performing acceptance testing, inspection pipes must provide a 2-inch-diameter clear opening and be completely clean, unobstructed, and either dry or filled with water as authorized.
 9. After acceptance testing is complete, completely fill the inspection pipes with water.

If the rigid cylinder fails to pass through the inspection pipe or if the inspection pipes were improperly installed:

1. Completely fill the inspection pipes with water immediately.
2. Suspend concrete placement in the remaining piles until additional measures to prevent blockage or bending of the inspection pipe are authorized by the Engineer.
3. Perform either of the following:
 - 3.1. Request the Department to perform CSL.
 - 3.2. Core a nominal 2-inch-diameter hole through the concrete for the entire length of the pile.

If CSL is requested:

1. The Department will perform CSL if the Engineer determines that CSL is necessary. Allow the Department 15 days to perform CSL and generate a CSL report. If CSL is performed, the Department will deduct \$2,000 if the pile diameter is 5 feet or under and \$4,000 if the pile diameter is over 5 feet.
2. Allow 10 days for the Department to determine whether the blocked pipe requires coring, hydro-blasting for downhole camera inspection, or if it is acceptable. Day 1 of the 10 days is either (1) the 1st day after the CSL report has been generated by the Department or (2) the 1st day after it is determined that CSL is not necessary or cannot be performed. If the Engineer determines that:
 - 2.1. Coring is required, core holes complying with the coring requirements below.
 - 2.2. Hydro-blasting is required, perform hydro-blasting.
 - 2.3. The blocked pipe is acceptable, the amount shown in the anomaly deduction table under section 49-3.02A(4)(d)(iii) will be deducted for each blocked pipe up to the maximum total deduction.

If you choose to core or if the Engineer determines that coring is required:

1. Coring must not damage the pile reinforcement.
2. Locate cored holes as close as possible to the inspection pipes they are replacing and no more than 5 inches clear from the reinforcement.
3. Core holes using a double wall core barrel system with a split tube type inner barrel. Coring with a solid type inner barrel is not allowed.
4. Coring methods and equipment must provide intact cores for the entire length of the pile.
5. Photograph and store concrete cores as specified for rock cores in section 49-1.01D(5).
6. The coring operation must be logged by an engineering geologist or civil engineer licensed in the State and experienced in core logging. Coring logs must comply with the Department's *Soil and Rock Logging, Classification, and Presentation Manual* for rock cores. Coring logs must include core

recovery, rock quality designation of the concrete, locations of breaks, and complete descriptions of inclusions and voids encountered during coring.

7. The Department evaluates the portion of the pile represented by the cored hole based on the submitted coring logs and concrete cores.

If the Department determines a pile is anomalous based on the CSL results, downhole camera inspection, or coring logs and concrete cores, the pile is rejected.

Replace the 1st paragraph of section 49-3.02C(6) with:

04-15-22

Section 49-2.01A(4)(c) and the 5th through 7th paragraphs of section 49-2.01C(5) do not apply to permanent steel casings.

Replace the 3rd paragraph of section 49-3.02C(7) with:

10-16-20

Section 49-2.01A(4)(c) and the 5th through 7th paragraphs of section 49-2.01C(5) do not apply to permanent casings specified in section 49-3.02C(7).

Delete the 2nd paragraph of section 49-3.02C(8).

04-19-19

Replace section 49-4 with:

10-15-21

49-4 STEEL SOLDIER PILING

49-4.01 GENERAL

49-4.01A Summary

Section 49-4 includes specifications for drilling holes, installing steel soldier piles, and placing concrete in the holes.

49-4.01B Definitions

dewatered hole: Drilled hole that:

1. Accumulates no more than 12 inches of water at the bottom during a 1-hour period without pumping from the hole
2. Has no more than 3 inches of water at the bottom immediately before placing concrete

49-4.01C Submittals

49-4.01C(1) General

Reserved

49-4.01C(2) Pile Installation Plan

Submit a pile installation plan. Include descriptions, details, and supporting calculations for:

1. Concrete mix designs for concrete backfill and lean concrete backfill
2. Methods, toolings, and equipment for drilling and cleaning hole
3. Number and sequence of piles you plan to install each day
4. Removing, handling, and disposing of drill cuttings
5. If temporary casing is used, proposed method of installing, drilling, placing concrete, and removing temporary casing
6. Placing, aligning, plumbing, spacing and securing the position of the pile before concrete placement
7. Theoretical volume of concrete to be placed at each pile
8. Verifying the bottom of the drilled hole is clean before concrete placement
9. Determining top of concrete elevation during concrete placement

10. Method of concrete placement in a dry or dewatered hole

For concrete placed under slurry, submit the additional information:

1. Method of placing concrete in a hole that is neither dry nor dewatered
2. Manufacturer's recommendations on the use of and test reports on the physical and chemical properties of the proposed slurry and any slurry chemical additives, including SDSs
3. Determining volume of slurry required for the work
4. Methods and equipment used for containment, mixing, agitating, placing, recirculating, and cleaning of the slurry
5. Slurry testing equipment and testing procedures
6. Methods of removing, handling, and disposing of drilled cuttings, contaminated concrete, and slurry

49-4.01C(3) Concrete Backfill Placement Report

Submit a concrete backfill placement report as an informational submittal within 2 business days of completion of concrete backfill placement in the hole.

The concrete backfill placement report must include:

1. Pile number, location, as-built tip elevation and concrete backfill cutoff elevation
2. Dates of drilling, concrete placement, and total quantity of concrete placed
3. Details of any hole stabilization methods and materials used
4. Drilling and tooling equipment used to complete the pile

49-4.01D Quality Assurance

Reserved

49-4.02 MATERIALS

49-4.02A General

Steel soldier piles must comply with section 49-2.03.

Concrete anchors must comply with the specifications for studs in clause 9 of AWS D1.1.

49-4.02B Slurry

Mineral slurry and synthetic slurry must comply with section 49-3.02B(6).

You may use water slurry. Water slurry must comply with the requirements shown in the following table:

Water Slurry Requirements

Quality characteristic	Test method	Requirement
Density Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1 Section 4	≤64 ^a
Sand content Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤1.0

^aIf authorized, you may use salt water slurry. The allowable density of the slurry may be increased by 2 pcf.

49-4.03 CONSTRUCTION

49-4.03A General

Construct steel soldier piles in a dry or dewatered hole. If the hole is not dry or dewatered and if authorized, construct steel soldier piles under slurry.

Drilling the hole, installing the pile, and placing concrete backfill and lean concrete backfill must be performed in a continuous operation, unless otherwise authorized.

Place concrete evenly on all sides of the pile and continuously from the bottom of the hole to the cut-off elevation. Concrete placement must not disturb pile alignment.

49-4.03B Drilled Holes

The axis of the drilled hole must not deviate from plumb more than 1 inch per 10 feet of length.

During drilling, do not disturb the foundation material surrounding the pile. Equipment or methods used for drilling holes must not cause (1) quick soil conditions or (2) scouring or caving of the hole.

If the pile center-to-center spacing is less than four pile diameters, do not drill holes for the adjacent piles until 24 hours have elapsed after concrete placement in the preceding pile.

If slurry is used during drilling operations, maintain the slurry level at a height required to maintain a stable hole but not less than 10 feet above the piezometric head.

After drilling begins, complete construction of the pile in one work shift to prevent deterioration of the surrounding foundation material. Remove and dispose of deteriorated foundation material, including material that has softened, swollen, or degraded, from the exposed surface.

Verify the bottom of the drilled hole is clean before placing the pile in the drilled hole.

If authorized, you may use temporary casing to control caving or ground water. Temporary casing must comply with section 49-3.02C(3).

If authorized to control caving or water seepage, you may enlarge portions of the hole, backfill the hole with slurry cement backfill or concrete, and redrill the hole to the diameter shown. The enlarged hole must allow for at least a 6-inch annulus of slurry cement or concrete surrounding the pile after the hole is redrilled.

49-4.03C Steel Soldier Piles

Plumb, align, and secure the pile before placing concrete. The hole must provide at least a 2-inch horizontal clearance around the pile for the full length of the hole. Provide vertical clearance at the tip of the pile as shown. Provide spacers if necessary. Ream or enlarge holes to provide the required clearance.

Before placing concrete, the pile must be secured in place and must not be suspended from a crane or other mobile equipment.

Maintain clearance and alignment of the pile in the hole while placing concrete.

49-4.03D Placing Concrete

Section 49-4.03D applies if placing concrete in a dry or dewatered hole.

Section 51-1.03D(3) does not apply to steel soldier piling.

Drilled holes must be clean and free of debris before concrete is placed.

Concrete must be directed to the bottom of the hole and not allowed to strike the sides of the hole. Placing concrete must not result in disturbance or caving of the hole. If necessary to prevent disturbance, use adjustable length pipes or tremie tubes to direct concrete to the bottom of the hole.

If temporary casing is used, remove temporary casing during concrete placement. Maintain the concrete within the casing at a level required to maintain a stable hole, but not less than 5 feet above the bottom of the casing, to prevent displacement of the concrete.

49-4.03E Placing Concrete Under Slurry

Section 49-4.03E applies if placing concrete under slurry.

Carefully place concrete in a compact, monolithic mass, using a method that prevents washing of the concrete. Do not vibrate the concrete.

The delivery system must consist of two tremie tubes, one on each side of the soldier pile, fed by one or more concrete pumps. The tremie tubes must be watertight steel tubes with sufficient rigidity to keep the tube ends in the mass of concrete placed for the full period of placement.

Do not allow concrete to fall into the groundwater or drilling slurry during concrete placement. Cap each delivery tube with a watertight cap or plug each tube above the slurry level with a tight-fitting moving plug

that expels the slurry from the tubes as the tubes are charged with concrete. The caps or plugs must be designed to release as the tubes are charged.

Extend each tremie tube to the bottom of the hole before charging the tube with concrete. After charging the tube with concrete, induce the flow of concrete through the tube by slightly raising the discharge end.

During concrete placement:

1. Embed the tip of the delivery tube within 6 inches of the bottom of the hole until 10 feet of concrete has been placed. Maintain embedment of the tip at least 10 feet below the top surface of the concrete.
2. Do not rapidly raise or lower the delivery tube.

If temporary casing is used, remove temporary casing from the hole during concrete placement. Maintain the concrete within the casing at the level required to prevent intrusion of groundwater, slurry, or soil, in the concrete but not less than 5 feet above the bottom of the casing until you reach the limits of concrete placement. Withdrawal of the casing must not cause contamination of the concrete with slurry.

Remove scum, laitance, and slurry-contaminated concrete from the top of the pile. Dispose of material resulting from placing concrete under slurry.

49-4.04 PAYMENT

Not Used

AA

51 CONCRETE STRUCTURES

04-15-22

Add to the beginning of section 51-1.01C(1):

04-19-19

If ordered, submit concrete form design and materials data for each forming system.

Replace section 51-1.01C(5) with:

04-17-20

51-1.01C(5) Drill and Bond Dowel—Chemical Adhesive

For each lot or batch of chemical adhesive used for drill and bond dowel chemical-adhesive systems, submit the following:

1. Certificate of compliance, including the material name and lot or batch number
2. Manufacturer's installation procedures, including the minimum cure time
3. SDS

For each chemical adhesive, submit 1 test sample for every 100 cartridges or fraction thereof to be used. The test sample must consist of 1 cartridge of chemical adhesive, 1 mixing nozzle, and 1 retaining nut. Submit test samples to METS at least 25 days before use.

Each test sample must clearly and permanently show the following:

1. Manufacturer's name
2. Material name
3. Lot or batch number
4. Expiration date
5. Evaluation report number
6. Directions for use
7. Storage requirements
8. Warnings or precautions required by State and federal laws and regulations

Replace the 3rd paragraph of section 51-1.01D(3)(b)(ii) with:

04-16-21

Before the testing, clean the test area by sweeping and removing debris.

Add between the 4th and 5th paragraphs of section 51-1.01D(3)(b)(ii):

04-16-21

Concrete roadway surfaces on the bridge deck and approach slabs must comply with the following smoothness requirements:

1. Profile trace having no high points over 0.02 foot
2. Profile count of 5 or less in any 100-foot section for portions within the traveled way
3. Surface not varying more than 0.02 foot from the lower edge of a 12-foot-long straightedge placed transversely to traffic

04-16-21

Delete the 6th paragraph of section 51-1.01D(3)(b)(ii).

Replace the 1st paragraph of section 51-1.01D(3)(b)(iii) with:

10-15-21

After deck surfaces and approach slabs have been textured, the Engineer performs friction testing of the concrete surfaces under California Test 342. Allow 25 days for the Department to schedule for coefficient of friction testing.

Add to the end of section 51-1.01D(3):

04-17-20

51-1.01D(3)(c) Drill and Bond Dowel—Chemical Adhesive

The Department will verify the chemical adhesive used in the drill and bond dowel chemical adhesive system is chemically consistent with the chemical adhesive material on the Authorized Materials List.

Add to the end of section 51-1.02B:

10-18-19

Concrete for concrete bridge decks or PCC deck overlays must contain:

1. Polymer fibers. Each cubic yard of concrete must contain at least 1 pound of microfibers and at least 3 pounds of macrofibers.
2. Shrinkage reducing admixture. Each cubic yard of concrete must contain at least 3/4 gallon of a shrinkage reducing admixture. If you use the maximum dosage rate shown on the Authorized Material List for the shrinkage reducing admixture, your submitted shrinkage test data does not need to meet the shrinkage limitation specified in section 90-1.02A.

Replace section 51-1.02D with:

04-17-20

51-1.02D Rapid Strength Concrete

For bridge decks or PCC deck overlays:

1. RSC must have a minimum 28-day compressive strength of 4,500 psi
2. RSC must contain at least 675 pounds of cementitious material per cubic yard

10-16-20

3. If your RSC shrinkage test results are 0.024 percent or less without the use of a shrinkage reducing admixture:

04-17-20

3.1 Use of shrinkage reducing admixture is not required

3.2 Fibers are not required

4. If you use the maximum dosage rate shown on the Authorized Material List for shrinkage reducing admixture, your shrinkage test results must be 0.032 percent or less

RSC must have a minimum 28-day compressive strength of 4,000 psi.

If you use chemical admixtures or SCMs, the same proportions must be used when testing.

If you use aggregate that is not on the Authorized Material List for innocuous aggregate, the cement in your proposed mix design must comply with one of the following:

1. Any hydraulic cement, with or without any proposed SCM, must have an expansion ratio of less than 0.10 percent when tested with glass aggregate under ASTM C1260. Test specimens must be prepared using proportions of ingredients under ASTM C441.
2. For Portland cement, the quantity of SCM in your proposed mix design must satisfy equation 1 of section 90-1.02B(3).

The specifications for a reduction in the operating range and contract compliance for cleanness value and sand equivalent specified in section 90-1.02C(2) and section 90-1.02C(3) for aggregate, do not apply to RSC used for a bridge element.

Replace the 1st paragraph of section 51-1.02G with:

10-15-21

Grout must consist of portland cement or portland limestone cement and water, with a water content of at most 4 gallons per 94 pounds of cement.

Replace the 1st paragraph of section 51-1.02H with:

04-17-20

Chemical adhesives for bonding dowels must be on the Authorized Material List for chemical adhesives and must be appropriate for the installation conditions of the project.

10-18-19

Delete the 5th paragraph of section 51-1.03C(2)(b).

Replace section 51-1.03D(2) with:

10-16-20

51-1.03D(2) Concrete Bridge Decks and Diaphragms

For decks on structural steel, install cross frames the entire width of the bridge before placing the deck concrete.

For concrete decks placed on bridges composed of continuous steel girders, place the portion of deck over the supports last.

For bridges composed of simple span PC concrete girders made continuous, place the deck (1) at least 5 days after placing the intermediate diaphragms or (2) after intermediate diaphragm concrete has attained a concrete compressive strength of at least 3,000 psi. Place end diaphragms with the portion of the deck over the supports last.

For bridges composed of simple span PC concrete girders not made continuous, place the deck (1) at least 5 days after placing the intermediate and end diaphragms or (2) after diaphragm concrete has attained a concrete compressive strength of at least 3,000 psi.

Deck closure pours must comply with the following:

1. During primary deck placement and for at least 24 hours after completing the deck placement, reinforcing steel protruding into the closure space must be free from any connection to reinforcing steel, concrete, forms, or other attachments of the adjacent structure.
2. Closure pour forms must be supported from the superstructure on both sides of the closure space.

Replace the 1st paragraph of section 51-1.03E(1) with:

10-16-20

Where shown, paint the structure name, bridge number, year constructed, and other bridge identification information. Painting concrete must comply with section 78-4.03C(3).

Bridge identification on the bridge barrier must comply with section 83-1.03D.

Bridge identification on the bridge substructure must be (1) painted at each structure approach facing and (2) visible to approaching traffic. At bents or piers, paint identification 10 feet above roadway finish grade elevation or water surface elevation.

Add to the end of section 51-1.03E(1):

04-17-20

Repair rejected holes, that will not be encased in concrete, with bonding material complying with section 51-1.02C.

Replace the 2nd paragraph of section 51-1.03E(3) with:

04-17-20

If reinforcement is encountered during drilling before the specified depth is attained, notify the Engineer. Unless coring through the reinforcement is authorized. Drill a new hole adjacent to the rejected hole to the depth shown.

Replace section 51-1.03E(5) with:

04-17-20

51-1.03E(5) Drill and Bond Dowel—Chemical Adhesive

Install dowels for the drill and bond dowel chemical adhesive system under the manufacturer's instructions. When installing dowels in new concrete, install after the concrete has cured for at least 28 days.

Drill the holes without damaging the adjacent concrete. Remove all loose dust and concrete particles from the hole and protect the hole from deleterious materials until the anchor is installed.

If reinforcement is encountered during drilling before the specified depth is attained, notify the Engineer. Unless coring through the reinforcement is authorized. Drill a new hole adjacent to the rejected hole to the depth shown.

Immediately after inserting the dowel into the chemical adhesive, support the dowel as necessary to prevent movement until the chemical adhesive has cured the minimum time specified in the manufacturer's instructions. Dowels must not be adjusted by bending. The adhesive must be fully cured before the dowel is put into service.

Replace dowels that fail to bond or are damaged.

Replace section 51-1.03F(4) with:

10-15-21

51-1.03F(4) Class 2 Surface Finish

Where a Class 2 surface finish is described:

1. Apply an ordinary surface finish to the concrete surface.
2. Abrasive blast the surface to a rough texture and then thoroughly wash the surface with water.
3. Pneumatically apply a mortar coat approximately 1/4 inch thick in at least 2 passes to the damp surface. The coating must firmly bond to the concrete surface.

The mortar coat must consist of either (1) sand, portland cement or portland limestone cement, and water, mechanically mixed before entering the nozzle or (2) premixed sand and cement, with water added before leaving the nozzle. The proportion of cement to sand must be at least 1 to 4. Use sand with a grading suitable for the work.

You may substitute cementitious material complying with section 90 for portland cement or portland limestone cement. You may use admixtures specified in section 90 if authorized.

Do not mortar coat areas where bridge name or other designations are to be painted.

The coating surface must be (1) uniform without unsightly bulges, depressions, or other imperfections and (2) as left by the nozzle. Protect the coating from damage and keep it damp for 3 days after placing. Remove and replace loose areas of coating.

Where a Class 2 surface finish is described for a pedestrian undercrossing, use silica sand and white portland cement or white portland limestone cement.

Replace the 2nd paragraph of section 51-1.03H with:

10-18-19

Cure the top surface of bridge decks by (1) misting and (2) the water method using a curing medium under section 90-1.03B(2). After strike-off, immediately and continuously mist the deck with an atomizing nozzle that forms a mist and not a spray. Continue misting until the curing medium has been placed and the application of water for the water method has started. At the end of the curing period, remove the curing medium and apply curing compound on the top surface of the bridge deck during the same work shift under section 90-1.03B(3). The curing compound must be curing compound no. 1.

10-18-19

Delete the 4th paragraph of section 51-1.03H.

Add to section 51-1.03:

10-19-18

51-1.03J Temporary Decking

If you are unable to complete bridge reconstruction activities before the bridge is to be opened to traffic, furnish and maintain temporary decking under section 48-4 until that portion of the work is complete.

Add to the end of section 51-2.01A(1):

10-18-19

The specifications for (1) shrinkage in section 90-1.02A, (2) shrinkage reducing chemical admixture in section 51-1.02B, and (3) polymer fibers in section 51-1.02B do not apply to concrete used to fill blocked-out recesses for joint seal assemblies.

Replace section 51-2.02B with:

04-16-21

51-2.02B Type A and AL Joint Seals

51-2.02B(1) General

51-2.02B(1)(a) Summary

Section 51-2.02B includes specifications for installing Type A and AL joint seals.

Type A and AL joint seals consist of field-mixed silicone sealant placed in grooves in the concrete.

51-2.02B(1)(b) Definitions

Reserved

51-2.02B(1)(c) Submittals

At least 15 days before delivery to the job site, submit a certificate of compliance, SDS, and manufacturer's instructions for:

1. Storing and installing:
 - 1.1. Joint seals.
 - 1.2. Backer rods. Include manufacturer data sheet verifying compatibility with the joint sealant.
2. Storing and applying primer, if required by the manufacturer.

51-2.02B(1)(d) Quality Assurance

Reserved

51-2.02B(2) Materials

Reserved

51-2.02B(2)(b) Type A and AL Joint Seal

Type A and AL joint seals must be on the Authorized Materials List for type A and AL joint seals.

Label sealant containers or provide identification tickets for tanks of 2-component material. Include the following:

1. Material designation
2. Lot number
3. Manufacturer's name
4. Date of manufacture and expiration

51-2.02B(2)(c) Backer Rods

Polyethylene foam or rod stock for retaining sealant must be commercial quality with a continuous, impervious glazed surface.

51-2.02B(3) Construction

51-2.02B(3)(a) General

Do not use sealant or adhesive that has skinned over or cannot be redispersed by hand stirring.

Do not use liquid components that have been exposed to air for more than 24 hours.

Abrasive blast clean joints and remove foreign material with high-pressure air immediately before installing seals. Protect waterstops during cleaning.

Joint surfaces must be surface dry when seals are installed.

Place the sealant using equipment that mixes and extrudes the sealant into the joint. The equipment and the sealant placement must be as recommended by the sealant manufacturer.

51-2.02B(3)(b) Type A Seal Preparation

For Type A joint seals, do not start cutting grooves until joint material is delivered to the job site.

Concrete saws for cutting grooves in the concrete must have diamond blades with a minimum thickness of 3/16 inch. Cut both sides of the groove simultaneously for a minimum 1st pass depth of 2 inches. The completed groove must have:

1. Top width within 1/8 inch of the width shown or ordered
2. Bottom width not varying from the top width by more than 1/16 inch for each 2 inches of depth
3. Uniform width and depth

Cutting grooves in existing decks includes cutting any conflicting reinforcing steel.

Saw cutting grooves is not required at the following locations:

1. Joints armored with metal
2. Joints in curbs, sidewalks, barriers, and railings, if grooves are formed to the required dimensions
3. Existing joints where Type A seals are to be installed

Remove all material from the deck joint to the bottom of the saw cut. Remove foreign material from joints in curbs, sidewalks, barriers, railings, and deck slab overhangs.

Repair spalls, fractures, or voids in the grooved surface at least 64 hours before installing the joint seal. Bevel the lips of saw cuts by grinding.

The Engineer may order you to saw cut grooves at existing joints to be sealed with a Type A joint seal. This work is change order work.

51-2.02B(3)(c) Type AL Seal Preparation

For Type AL joint seals, remove expanded polystyrene and foreign material to the depth of the joint seal. Grind or edge the lip of the joint.

51-2.02B(4) Payment

Not Used

Replace the 2nd paragraph of section 51-4.01C(1) with:

04-19-19

For PC PS concrete girders and deck panels, submit an erection work plan. The work plan must be signed by an engineer who is registered as a civil engineer in the State and include procedures, details, and sequences for:

1. Unloading
2. Lifting
3. Erecting
4. Temporary bracing installation

Replace the 1st paragraph of section 51-4.01C(2)(a) with:

04-19-19

Submit shop drawings for PC concrete members to the OSD Documents Unit unless otherwise specified.

Replace *Reserved* in section 51-4.01C(2)(e) with:

04-19-19

For PC deck panels, shop drawings must include:

1. Panel materials, shapes, and dimensions.
2. Deck panel layout identifying the locations of each panel.
3. Reinforcing, joint, and connection details.
4. Complete details of the methods, materials, and equipment used in prestressing and precasting work.
5. Type of texture and method of forming the textured finish.

6. Methods and details for lifting, bracing, and erection.
7. Method of support and grade adjustment.
8. Methods of sealing against concrete leaks.

Replace the 2nd paragraph of section 51-4.02B with:

04-19-19

Handle, store, transport, and erect PC members in a position such that the points of support and directions of the reactions with respect to the member are approximately the same as when the member is in its final position.

Replace *Reserved* in section 51-4.02D(7) with:

04-19-19

Clearly label the top surface of each panel with the word *TOP* as shown on the deck panel layout using waterproof paint or other authorized means.

Apply a coarse texture to at least 90 percent of the deck panel top surface area by brooming with a stiff bristled broom or by other suitable devices that results in uniform scoring parallel with the prestressing strands. The top surface texture must have a maximum 1/8-inch texture.

Each camber strip must:

1. Consist of high density expanded polystyrene with a minimum compressive strength of 55 psi.
2. Consist of a single layer and extend continuously under each deck panel.
3. Achieve a height that accounts for roadway profile, cross slope, and girder camber.
4. Have 1/4-inch v-notches or 1/2 by 1/2-inch slots cut into the top surface on 4-foot centers.

Camber strip dimensions must comply with the following table:

Polystyrene Camber Strip Dimensions

Height (H) (inches)	Width (W) (inches)
1 to 2.5	1.5
Greater than 2.5 and less than or equal to 3.5	1.75
Greater than 3.5 and less than or equal to 4	2

Chemical adhesive must be suitable for use with concrete and polystyrene.

For the concrete deck pour, the aggregate must comply with the 1/2-inch maximum or the 3/8-inch maximum combined aggregate gradation specified in section 90-1.02C(4)(d).

Add between the 5th and 6th paragraphs of section 51-4.03B:

10-19-18

Erect steel or PC girders onto the supporting concrete, such as bent caps or abutments, after the concrete attains a compressive strength of 2,880 psi or 80 percent of the specified strength, whichever is greater.

Replace *Reserved* in section 51-4.03G with:

04-19-19

Construct the deck panel system in the following sequence:

1. After girders and diaphragms are in place, place each polystyrene camber strip along the top of each girder. Apply a continuous bead of chemical adhesive to the top and bottom of each camber strip to prevent gaps between the camber strip and concrete members.

2. Place each deck panel as shown on the deck panel layout such that each panel bears uniformly on the camber strips.
3. Abrasive blast clean deck panel and girder surfaces before placing deck reinforcement. Remove all surface laitance, curing compound, and other foreign materials. Thoroughly clean under the edges of each panel to ensure removal of construction debris before the stage 1 deck pour.
4. Place deck reinforcement.
5. Place deck concrete in a two-stage continuous pour:
 - 5.1. Place and vibrate stage 1 concrete over the girders by completely filling the area between the camber strips in from 15 to 30 feet longitudinal sections ahead of the stage 2 concrete deck pour. Check slots or holes in camber strips to ensure removal of air voids and full consolidation during concrete placement.
 - 5.2. Place stage 2 concrete deck over stage 1 concrete and deck panels as to not result in a cold joint between the two stages.

If required, install temporary bracing between the ends of each deck panel to prevent transverse panel movement that could lead to loss of bearing on the camber strips.

Loads placed on deck panels during construction must not exceed 50 psf.

Replace the row for *Apparent elongation* in the table in the 2nd paragraph of section 51-5.02B with:

Apparent elongation (max, percent)	ASTM D4632	35
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04-19-19

Replace the 1st paragraph of section 51-5.02F with:

Steel components of abutment ties must comply with section 75-1.

04-15-22

Replace the 3rd paragraph of section 51-5.02F with:

Steel angles, plates, and bars at concrete barrier joints must comply with section 75-1.

04-15-22

Replace section 51-8 with:

51-8 HINGE TRANSVERSE SHEAR KEY

10-15-21

51-8.01 GENERAL

Section 51-8 includes specifications for fabricating hinge transverse shear keys.

51-8.02 MATERIALS

Hinge transverse shear keys must consist of HSS tubular section, HS threaded rods, nuts, washers, angles, mechanical expansion anchors, building paper, polyethylene, and thread-locking system.

04-15-22

HSS tubular section must comply with the specifications for steel structural tubing in section 55-1.02D(1).

10-15-21

HS threaded rods, nuts, and washers must comply with section 55-1.02D(1).

Angles must comply with section 55-1.02D(3).

Mechanical expansion anchors must comply with section 75-3.02C.

Building paper must be commercial-quality, 30-pound asphalt felt.

- 2.1. Slope and channel paving 10-15-21
- 2.2. Concrete barrier Type 60 10-16-20
- 3. Plain bars for spiral or hoop reinforcement in structures and concrete piles

Add to the list in the 2nd paragraph of section 52-1.02B:

- 10. Drainage inlets 10-16-20

Replace section 52-1.02E with:

52-1.02E Dowels

52-1.02E(1) General

Reinforcing steel dowels must be deformed bars complying with section 52-1.02B.

Threaded rods used as dowels must comply with section 75-1.02A.

52-1.02E(2) Dowels for Drill and Bond Dowel—Chemical Adhesive

Dowels for drill and bond dowel chemical-adhesive systems must be one of the following:

- 1. Threaded rods complying with ASTM F1554, Grade 36
- 2. Deformed bar reinforcement complying with section 52-1.02B
- 3. Stainless steel reinforcement complying with ASTM A955/A955M, Grade 60, UNS Designation S31653, S32304, S32205, or S31803

Replace the 2nd paragraph of section 52-2.02A(3)(c) with:

Submit a certificate of compliance for the patching material and one of the following:

- 1. Certification that the patching material is compatible with the epoxy powder to be used.
- 2. Copy of the patching material container label showing the patching material is compatible with the epoxy powder to be used.

Delete the 3rd paragraph of section 52-2.02A(3)(c).

Replace the 1st paragraph of section 52-2.02A(4)(b) with:

Test samples must comply with the requirements for coating thickness specified in ASTM A775/A775M for bar reinforcement or ASTM A884/A884M Class A, Type 1 for wire reinforcement, as follows:

- 1. If both test samples comply with the requirements, the Department accepts all epoxy-coated reinforcement represented by the test.
- 2. If both test samples do not comply with the requirements, the Department performs 1 additional test on the reinforcement of the same size from the same shipment. This additional test consists of testing 2 test samples, randomly selected by the Engineer, for coating thickness. If both test samples do not comply with the specified requirements, the Department rejects all epoxy-coated reinforcement represented by the test.

Replace the 1st paragraph of section 52-2.03A(4)(b) with:

10-16-20

Test samples must comply with the requirements for coating thickness specified in ASTM A934/A934M for bar reinforcement or ASTM A884/A884M Class A, Type 2 for wire reinforcement, as follows:

1. If both test samples comply with the requirements, the Department accepts all epoxy-coated reinforcement represented by the test.
2. If both test samples do not comply with the requirements, the Department performs 1 additional test on the reinforcement of the same size from the same shipment. This additional test consists of testing 2 test samples, randomly selected by the Engineer, for coating thickness. If both test samples do not comply with the specified requirements, the Department rejects all epoxy-coated reinforcement represented by the test.

Replace the 2nd paragraph of section 52-5.01D(3) with:

10-16-20

After receiving notification that lots are ready for QC testing, the Engineer randomly selects department acceptance test samples and places tamper-proof markings or seals on the test samples. Test samples must be removed from:

1. First QC lot
2. Each subsequent group of QC lots

Replace the introductory clause in the 2nd paragraph of section 52-5.01D(4)(b) with:

10-16-20

Headed bar reinforcement test samples are tested for necking under Necking Option I as specified in CT 670 and tensile tested:

Replace the 2nd paragraph of section 52-5.02 with:

10-16-20

At fracture, headed bar reinforcement must comply with:

1. Tensile requirements of ASTM A970/A970M, Class A.
2. Necking requirements under CT 670 by showing signs of visible necking in the reinforcing bar. The visible necking must be located outside the affected zone.

Replace section 52-6.01B with:

10-16-20

52-6.01B Definitions

Reserved

Replace item 10.2. in the list in the 2nd paragraph of section 52-6.01C(4)(b) with:

10-16-20

- 10.2. Strain measured on the side without the fracture

Replace item 6 in the list in the 1st paragraph of section 52-6.01C(6)(c) with:

10-16-20

6. Manufacturer's QC Process Manual that details the production process and the frequency of QC measures

Replace the 2nd and 3rd paragraphs of section 52-6.01D(2)(b) with:

10-16-20

Each operator must prepare 4 prequalification splice test samples for each bar size of each splice coupler model type and position to be used.

Splice test samples for operator and procedure prequalification must have been prepared and tested no more than 2 years before the submittal of the splice prequalification report.

Replace the 1st paragraph of section 52-6.01D(3)(b) with:

10-16-20

After completing the ultimate butt splices in a lot, including any required epoxy coating, notify the Engineer that the splices are ready for testing. The Engineer selects splice test samples at the job site or PC plant. For hoops, the Engineer selects splice test samples from the completed lot at the job site, PC plant, or fabrication plant.

Replace the 4th paragraph of section 52-6.01D(4)(b)(iv) with:

10-16-20

For splices made vertically at the jobsite in or above their final positions for bar reinforcement of columns or CIP concrete piles, you may prepare test samples as specified for service splice test samples in section 52-6.01D(4)(b)(iii) if authorized. Test the splice test samples as specified for ultimate butt splice test samples.

Replace the 1st paragraph of section 52-6.01D(5) with:

10-16-20

The Department tests and accepts service splices and ultimate butt splices as specified for QC testing in section 52-6.01D(4).

Replace the 3rd paragraph of section 52-6.02B(1) with:

10-16-20

Mechanical couplers must be on the Authorized Material List for steel reinforcing couplers. Resistance welding fabricators must be on the Authorized Material List for resistance welding fabricators.

Replace the introductory clause in the 3rd paragraph of section 52-6.03B with:

10-16-20

For uncoated and galvanized reinforcing bars complying with ASTM A615/A615M, Grade 60, ASTM A706/A706M, ASTM A1035/A1035M, or ASTM A767/A767M, Class 1, the length of lap splices must be at least:

Replace the introductory clause in the 4th paragraph of section 52-6.03B with:

10-16-20

For epoxy-coated reinforcing bars and alternatives to epoxy-coated reinforcing bars complying with ASTM A775/A775M, ASTM A934/A934M, or ASTM A1055/A1055M, the length of lap splices must be at least:

Replace the 1st sentence in item 2 in the list in the 3rd paragraph of section 53-1.02 with:

10-18-19

2. You may substitute a maximum of 40 percent coarse aggregate for the fine aggregate.

Replace section 53-1.03B with:

10-18-19

53-1.03B Preparing Receiving Surfaces

Evenly grade the receiving surface before applying shotcrete. No point on the graded slope may be above the slope plane shown.

Thoroughly compact the receiving surface. The receiving surface must contain enough moisture to provide a firm foundation and prevent excess absorption of water from the shotcrete. The receiving surface must be free of surface water.

Forms must comply with section 51-1.03C(2). Reinforce, secure, and brace forms to maintain form alignment against distortion from shotcrete operations. Install and maintain alignment control means at corners or offsets not established by forms or shotcrete operations.

Use ground wires to establish thickness, surface planes, and finish lines. Use temporary coverings to protect adjacent surfaces from the nozzle stream.

Replace section 53-1.03C with:

10-18-19

53-1.03C Applying Shotcrete

Dry-mix or wet-mix shotcrete must be applied by the nozzle.

Apply shotcrete using small circular motions of the nozzle while building the required thickness. Direct the nozzle perpendicular to the receiving surface with the nozzle held at such a distance to produce maximum consolidation and full encapsulation of the reinforcement. Shotcrete must completely encase reinforcement and other obstructions.

Apply shotcrete first in corners, voids, and areas where rebound or overspray cannot easily escape. Do not incorporate rebound or overspray in the work.

Before applying subsequent layers of shotcrete:

1. Allow shotcrete to stiffen sufficiently. Remove hardened overspray and rebound from adjacent surfaces, including exposed reinforcement.
2. Use a cutting rod, compressed air blowpipe, or other authorized methods to remove all loose material, overspray, laitance, or other deleterious materials that may compromise the bond of the subsequent layers of shotcrete.
3. Bring the receiving surface to a saturated surface-dry condition immediately before applying subsequent layer.

For dry-mix shotcrete:

1. Adjust air volume, material feed volume, and distance of the nozzle from the work as necessary to encase reinforcement.
2. Maintain uniform water pressure at the nozzle of at least 15 psi greater than the air pressure at the machine.
3. Do not use aggregate and cementitious materials that have been mixed for more than 45 minutes.

For wet-mix shotcrete:

1. Transport shotcrete under section 90-1.02G(3).
2. Apply ground wires at approximately 7-foot centers.

3. Select a slump range that will effectively encapsulate reinforcement within the work but not cause shotcrete to sag or slough during application.

Replace section 53-1.03D with:

10-18-19

53-1.03D Finishing Shotcrete

Apply shotcrete to the line and grade shown. Leave finished shotcrete surface as gun finish unless otherwise described.

Do not initiate cutting or finishing until the shotcrete has set sufficiently to avoid sloughing or sagging. The finished surface must be smooth and uniform for the type of work involved.

Remove and replace loose areas of shotcrete.

Cure shotcrete for at least 7 days by any of the methods specified in section 90-1.03B. If the curing compound method is used for a gun or roughened surface, apply the curing compound at twice the specified rate. If you add a coloring agent to the shotcrete and you use the curing compound method for curing the shotcrete, use curing compound no. 6.

Protect shotcrete under section 90-1.03C.

Replace the 2nd paragraph of section 53-1.04 with:

10-18-19

The Department does not pay for shotcrete applied outside the dimensions shown or to fill low areas of receiving surfaces.

Replace the paragraph of section 53-2.01A with:

10-18-19

Section 53-2 includes specifications for applying structural shotcrete. Structural shotcrete must be applied using wet-mix shotcrete.

Replace *qualifications* in item 1.1 in the list in the 1st paragraph of section 53-2.01C with:

10-18-19

certifications

Replace the paragraph of section 53-2.01D(2) with:

10-18-19

Nozzlemen performing the work must hold current ACI CPP 660.1-17 certification as a nozzleman for wet-mix shotcrete. Nozzlemen performing overhead shotcrete work must hold current qualifying ACI CPP 660.1-17 certification in the overhead shooting orientation for wet-mix shotcrete.

Replace the 2nd paragraph of section 53-2.01D(3) with:

10-18-19

Each nozzleman performing the work must construct 1 unreinforced test panel and 1 reinforced test panel for each proposed mix design. The test panel orientation must match the orientation of the work.

Replace the 1st sentence in the 1st paragraph of section 53-2.01D(4)(b) with:

10-18-19

Obtain at least four 3-inch-diameter test cores from each 50 cu yd, or portion thereof, of shotcrete applied.

Add between the 1st and 2nd paragraphs of section 53-2.01D(4)(b):

10-19-18

For soil nail walls, do not core through waler bars.

Replace section 53-2.02 with:

10-18-19

53-2.02 MATERIALS

Shotcrete must comply with the specifications for concrete in section 90-1.

Shotcrete must have a minimum compressive strength of 3,600 psi, unless otherwise described.

Mortar and alternative filler material must comply with section 60-3.05B(2).

Delete the 2nd paragraph of section 53-2.03.

10-18-19

Add between the 3rd and 4th paragraphs of section 53-2.03:

10-18-19

Before applying shotcrete, reinforcement must be:

1. Free from loose rust, oil, curing compound, overspray, or other material deleterious to the bond between concrete and steel.
2. Lapped separated by one of the following:
 - 2.1. Three times the diameter of the largest reinforcing bar.
 - 2.2. Three times the maximum size aggregate.
 - 2.3. Two inches, whichever is least, unless otherwise specified. Lapped bars must be in the same plane and parallel to the shooting direction.
3. Securely tied to minimize movement or vibration.

The temperature of reinforcement and receiving surfaces must be below 90 degrees F before applying shotcrete.

Apply the wet-mix shotcrete continuously removing accumulations of rebound and overspray using a compressed air blowpipe. Ensure the nozzleman and the blowpipe operator work together and the nozzleman does not get ahead of the blowpipe operator.

10-18-19

Delete the 4th paragraph of section 53-2.03.

Replace the 7th paragraph of section 53-2.03 with:

10-18-19

If a finish coat is used, clean the surface before applying the finish coat. Wash receiving surface with an air-water blast to remove all loose material, laitance, overspray, or other material that may compromise the bond of subsequent layers of shotcrete.

Nondestructive Testing for Steel Standards and Poles

Weld location	Weld type	Minimum required NDT
Circumferential splices around the perimeter of tubular sections, poles, and arms	CJP groove weld with backing ring	100% UT or RT
Longitudinal seam	CJP or PJP groove weld	Random 25% MT
Longitudinal seam within 6 inches of a circumferential weld	CJP groove weld	100% UT or RT
Welds attaching base plates, flange plates, pole plates, or mast arm plates to poles or arm tubes	CJP groove weld with backing ring and reinforcing fillet	t ≥ 1/4 inch: 100% UT and 100% MT t < 1/4 inch: 100% MT after final weld pass
	External (top) fillet weld for socket-type connections	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all standards and poles
Longitudinal seam on the telescopic female end, designated slip-fit length plus 6 inches	CJP groove weld	100% UT or RT

NOTE: t = pole or arm thickness

Nondestructive Testing for Overhead Sign Structures

Weld location	Weld type	Minimum required NDT
Base plate to post	CJP groove weld with backing ring and reinforcing fillet	100% UT and 100% MT
Base plate to gusset plate	CJP groove weld	100% UT
Circumferential splices of pipe or tubular sections	CJP groove weld with backing ring	100% UT or RT
Split post filler plate welds	CJP groove weld with backing bar	100% UT or RT
Longitudinal seam weld for pipe posts	CJP groove weld	t < 1/4 inch: 25% MT t ≥ 1/4 inch: 25% UT or RT
	PJP groove weld	Random 25% MT
Chord angle splice weld	CJP groove weld with backing bar	100% UT or RT
Truss vertical, diagonal, and wind angles to chord angles	Fillet weld	Random 25% MT
Upper junction plate to chord (cantilever type truss)	Fillet weld	Random 25% MT
Bolted field splice plates (tubular frame type)	CJP groove weld	100% UT and 100% MT
Cross beam connection plates (lightweight extinguishable message sign)	Fillet weld	Random 25% MT
Arm connection angles (lightweight extinguishable message sign)	Fillet weld	100% MT
Mast arm to arm plate (lightweight extinguishable message sign)	CJP groove weld with backing ring	t ≥ 1/4 inch: 100% UT and 100% MT t < 1/4 inch: 100% MT after final weld pass
Post angle to post (lightweight extinguishable message sign)	Fillet weld	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all sign structures

NOTE: t = pole or arm thickness

Replace section 56-1.01D(2)(b)(ii) with:

56-1.01D(2)(b)(ii) Ultrasonic Testing

04-19-19

For UT of welded joints with any members less than 5/16-inch thick or tubular sections less than 24 inches in diameter, the acceptance and repair criteria must comply with Clause 10.26.1.1 of AWS D1.1.

10-16-20

When performing UT, use an authorized procedure under AWS D1.1, Annex O.

10-15-21

For UT of other welded joints, the acceptance and repair criteria must comply with Table 8.3 of AWS D1.1 for cyclically loaded nontubular connections.

10-16-20

After galvanization, perform additional inspection for toe cracks along the full length of all CJP groove welds at multisided tube-to-transverse base plate connections using UT.

04-16-21

Replace section 56-2 with:

04-16-21

56-2 OVERHEAD SIGN STRUCTURES

56-2.01 GENERAL

56-2.01A Summary

Section 56-2 includes specifications for constructing overhead sign structures.

Furnishing sign structures includes furnishing anchor bolt assemblies, removable sign panel frames, sign structure hardware, and fabricated sign structures at the job site, ready for installation, including welding and painting or galvanizing as required.

Installing sign structures includes installing anchor bolt assemblies, removable sign panel frames and sign panels, and performing any welding and painting or galvanizing required during installation.

Types of overhead sign structures include:

1. Truss
2. Versatile truss
3. Bridge mounted
4. Tubular

56-2.01B Definitions

Reserved

56-2.01C Submittals

56-2.01C(1) General

Allow 30 days for the Department's review.

56-2.01C(2) Shop Drawings

Submit 2 copies of shop drawings for sign structures. Include:

1. Sign panel dimensions
2. Span lengths
3. Post heights
4. Anchorage layouts
5. Proposed splice locations
6. Snugging and tensioning pattern for anchor bolts and HS bolted connections
7. Details for permanent steel anchor bolt templates
8. Details of clips, eyes, or removable devices for preventing damage to the finished galvanized or painted surfaces used for:
 - 8.1. Securing the sign during shipping
 - 8.2. Lifting and moving during erection

56-2.01C(3) Quality Control Program

Submit a QC program for sign structures. Include methods, equipment, and personnel to be used during fabrication and installation.

Submit the QC program with the shop drawing submittal.

56-2.01D Quality Assurance

56-2.01D(1) General

Reserved

56-2.01D(2) Quality Control

56-2.01D(2)(a) General

Reserved

56-2.01D(2)(b) Nondestructive Testing

Reserved

56-2.01D(2)(c) Walkway Safety Railing

The assembled and raised walkway safety railing must have less than 1 inch of wobble when a 50-lb horizontal load is applied alternating each way at the top center of each railing section.

56-2.01D(3) Department Acceptance

The Department inspects structural materials for sign structures at the fabrication site. You must:

1. Notify the Engineer when the materials are delivered to the fabrication site
2. Allow at least 10 days after delivery of the material for inspection before starting fabrication

56-2.02 MATERIALS

56-2.02A General

Materials must comply with section 55.

Do not use weathering steel.

56-2.02B Bars, Plates, Shapes, and Structural Tubing

56-2.02B(1) General

Materials must comply with the requirements shown in the following table:

Structural Steel	
Material	Specification
Bars and plates	ASTM A36/A36M; ASTM A709/A709M, Grade 36 or 50; ASTM A572/A572M, Grade 42 or 50; or ASTM A1043/A1043M, Grade 36 or 50
Bars and plates for overhead versatile truss	ASTM A709/A709M, Grade 50; ASTM A1043/A1043M, Grade 50; ASTM A572/A572M, Grade 50; or ASTM A945/A945M, Grade 50
Other open shapes	ASTM A36/A36M; ASTM A709/A709M, Grade 36 or 50; ASTM A992/A992M; ASTM A1043/A1043M, Grade 36 or 50; or ASTM A529/A529M, Grade 50
Other open shapes for overhead versatile truss	ASTM A709/A709M, Grade 50; ASTM A529/A529M, Grade 50; ASTM A572/A572M, Grade 50; ASTM A992/A992M; ASTM A1043/A1043M, Grade 50; or ASTM A913/A913M, Grade 50

Light fixture mounting channel must be continuous slot channel made from one of the following:

1. Steel complying with ASTM A1011/A1011M, Designation SS, Grade 33
2. Extruded aluminum of alloy 6063-T6 complying with ASTM B221 or B221M

Structural tubing and hollow structural sections must be structural steel complying with ASTM A500/A500M, Grade B or ASTM A1085.

Surface flatness after galvanizing must comply with ASTM A6/A6M for the following:

1. Base plates that are to come in contact with concrete, mortar, or washers and leveling nuts
2. Plates in high-strength bolted connections

56-2.02B(2) Charpy V-notch Impact

10-15-21

Steel components over 1/2-inch thick must comply with the CVN testing requirements for ASTM A709/A709M Grade 50 steel in section 55-1.02D(2) if they are shown as main tension members or are welded to members shown as main tension members. For HSS shapes, the thickness is the nominal wall thickness. For other shapes, the thickness is the largest of the nominal thicknesses of the member. HSS members complying with ASTM A1085 are exempt from this requirement.

56-2.02C Sheets

Sheets must be carbon steel complying with ASTM A1011/A1011M, Designation SS, Grade 33.

56-2.02D Bolted Connections

Bolts, nuts, and washers must comply with section 55-1.02D(1).

Components of HS bolts must comply with section 55 for high strength steel fastener assemblies unless the bolts are shown to be snug tight. Bolts, nuts, and washers for HS bolts shown to be snug tight must comply only with section 55-1.02D(1).

Anchor bolts must comply with ASTM F1554, Grade 55, weldable steel.

Use a permanent steel template to maintain the proper anchor bolt spacing.

Provide 1 top nut, 1 leveling nut, and 2 washers for the upper threaded portion of each anchor bolt.

56-2.02E Anchorages

Anchorages for bridge mounted sign structures must comply with the specifications for concrete anchorage devices in section 75-3.

56-2.02F Pipe Posts

Pipe posts must be welded or seamless steel pipes. Spiral seam welds are not allowed. The maximum ultimate tensile strength of pipe posts must not exceed 90 ksi. The maximum tensile yield strength of pipe posts must not exceed 70 ksi. Pipe posts having a yield strength of 50 ksi or more must comply with the Charpy V-Notch requirements in ASTM A1085/1085M.

Manufactured pipe posts must comply with one of the following:

1. API Specification 5L PSL2 Grades X52M or X52N, using nominal pipe sizes for threaded end pipe.
2. If the specified yield strength is 35 ksi or less:
 - 2.1. ASTM A53/A53M, Grade B
 - 2.2. ASTM A106/A106M, Grade B
 - 2.3. ASTM A1085/A1085M, Grade A
 - 2.4. API Specification 5L PSL1 or PSL2 Grades B, X42R or X42M, using nominal pipe sizes for threaded end pipe

You may fabricate pipe posts from steel complying with one of the following:

1. ASTM A572/A572M, Grade 50
2. ASTM A709/A709M, Grade 50
3. ASTM A1043/A1043M, Grade 50
4. ASTM A945/A945M, Grade 50
5. If the specified yield strength is 35 ksi or less:
 - 5.1. ASTM A36/A36M
 - 5.2. ASTM A709/A709M, Grade 36
 - 5.3. ASTM A572/A572M, Grade 42
 - 5.4. ASTM A1043/A1043M, Grade 36

56-2.02G Walkway Gratings**56-2.02G(1) General**

Gratings must be the standard product of an established grating manufacturer.

56-2.02G(2) Steel Walkway Gratings

Steel walkway gratings must comply with the following:

1. Material for gratings must be structural steel complying with ASTM A1011/A1011M as specified for Designation CS, Type B or Designation SS, Grade 36, Type 1
2. For welded type gratings, each joint must be full resistance welded under pressure to provide a sound, completely beaded joint
3. For mechanically locked gratings:

- 3.1. Method of fabrication and interlocking of the members must be authorized
- 3.2. Fabricated grating must be equal in strength to the welded type
4. Gratings must be accurately fabricated and free from warps, twists, or defects affecting their appearance or serviceability including:
 - 4.1. Ends of all rectangular panels must be square
 - 4.2. Tops of the bearing bars and cross members must be in the same plane
 - 4.3. Gratings distorted by the galvanizing process must be straightened

56-2.02G(3) Aluminum Walkway Gratings

Aluminum walkway gratings must comply with the following:

1. Standard Specifications for Metal Bar Gratings and treads as published in the *NAAMM Metal Bar Grating Manual*, latest edition
2. Minimum grating panel width is 2' nominal
3. Either Type P-19-4 1-1/4 by 3/16 inch aluminum or Type P-19-4 1-1/2 inch I-Bar aluminum
4. Include toe boards that project vertically a nominal 4" above top of gratings and are securely attached to grating

56-2.02H Elastomeric Bearing Pads

Elastomeric bearing pads must comply with section 51-3.02.

56-2.02I Safety Chain at Walkways

Safety chain at walkways must comply with ASTM A413/A413M, Grade 43. The nominal chain size must be 1/4 inch. Use the minimum length that allows lock-up of safety railing.

56-2.02J Safety Cable at Walkways

Safety cable at walkways must:

1. Be constructed of Type 302 or 304 stainless steel 7 by 19 wire strand core cable
2. Have a cable breaking strength of at least 10,000 lb
3. Not be prestretched

56-2.02K Fabrication

56-2.02K(1) General

Sign structures must be:

1. Free from kinks, twists, or bends
2. Uniform in appearance

Fabricate sign structures into the largest practical sections before galvanizing.

Assemble the completed sections in the shop. Check sections for straightness, alignment, and dimension. Correct any variation.

Affix clips, eyes, and removable brackets to all signs and all posts for securing the sign during shipping, lifting, moving, and erection. Secure the sign as necessary to prevent damage to the finished galvanized or painted surfaces.

Do not make any holes in members unless the holes are shown or authorized.

Form the posts for tubular sign structures to the radii shown by heat treatment or by fabrication methods that will not:

1. Crimp or buckle the interior radius of the pipe bend
2. Change the physical characteristics of the material

56-2.02K(2) Welding

PJP longitudinal seam welds for tapered tubular members must have at least the minimum penetration shown but not less than 60 percent penetration. Within 6 inches of circumferential welds, longitudinal seam welds must be CJP groove welds.

Except for welds at posts shown as PJP welds, longitudinal seam welds of fabricated pipe posts must be CJP groove welds.

Except for walkway safety railing, welding filler metal for versatile truss must be greater than or equal to 70 ksi.

10-15-21

Obtain authorization prior to repairs of cracks or more than 2 repairs to circumferential welds and to base plate-to-post welds.

04-16-21

56-2.02K(3) Bolted Connections

Except for HS bolts shown to be snug-tight, HS bolted connections must be HS assemblies complying with section 55-1.02E(6) except assemblies must consist of:

1. HS steel bolts
2. Nuts
3. Hardened washers
4. Direct tension indicators

HS fastener assemblies and any other HS bolts, nuts, and washers attached to sign structures must be zinc-coated by the mechanical deposition process.

Nuts for HS bolts at joints designated as snug-tight must not be lubricated.

Use an alternating snugging and tensioning pattern for anchor bolts and HS bolted splices. Once tensioned, do not reuse HS fastener components.

For bolt diameters less than 3/8 inch, the diameter of the bolt hole must be not more than 1/32 inch larger than the nominal bolt diameter.

For bolt diameters greater than or equal to 3/8 inch, the diameter of the bolt hole must be not more than 1/16 inch larger than the nominal bolt diameter.

56-2.02K(4) Walkway

Safety cable at walkways must be continuous between lugs. Before tightening cable clips at the end anchorage, remove the slack in the cable.

Safety cable at walkways must not be kinked, knotted, deformed, frayed, or spliced.

Install clips at safety cables under the manufacturer's instructions.

56-2.02K(5) Handholes

The edges of handholes and other large post and arm openings must be ground smooth. The roughness of edges must be less than 0.001 inch.

56-2.02K(6) Identification Plate

Attach rectangular corrosion-resistant metal identification on all trusses and posts using stainless steel rivets or stainless steel screws as follows:

1. For posts, locate the plate on the traffic side near the base of all posts.
2. For trusses, locate the plate on an outward face of a bottom chord angle where it will be easily visible from the shoulder or the median.

The lettering on each identification plate must be:

1. Either depressed or raised
2. 1/4 inch tall
3. Legible
4. Readable after the support structure is coated and installed

Include the following information on the plate.

1. Name of the manufacturer
2. Date of manufacture
3. Contract number
4. *Standard Plan* year
5. Length, use one of the following:
 - 5.1. For posts, "h=" and the dimension from bottom of base plate to bottom of truss
 - 5.2. For single trusses, the length of each cantilever
 - 5.3. For two post trusses, the length of the center span and the length of each cantilever

56-2.02L Surface Finish

56-2.02L(1) General

Galvanize all ferrous metal parts of the following sign structure types:

1. Truss
2. Bridge mounted
3. Tubular

Except for tubular type sign structures, do not paint sign structures.

Clean and paint all ferrous metal parts of tubular sign structures after galvanizing, including the areas to be covered by sign panels.

Do not treat galvanized surfaces with chemicals before cleaning and painting.

Galvanize and do not paint walkway gratings, walkway brackets, gutters, safety railings, steel mountings for light fixtures, and all nuts, bolts, and washers for sign structures after fabrication.

56-2.02L(2) Galvanizing

Galvanizing must comply with section 75-1.02B except surfaces may be coated with zinc by the thermal spray coating process if authorized.

If authorized to use thermal spray coating, apply the coating under section 59-5. The thickness of the sprayed zinc coat must be at least 5 mils.

Do not use zinc solders or zinc alloys that contain tin to repair a damaged galvanized surface.

56-2.02L(3) Cleaning and Painting

Where specified, clean and paint sign structures under section 59-4.

56-2.03 CONSTRUCTION

56-2.03A General

Do not fasten any bridge-mounted sign to concrete elements of bridges or railings before the concrete attains a compressive strength of 2,500 psi.

After erection, remove the brackets used to secure tubular sign structures during shipping and lifting.

Install sign panels as shown. Install laminated and formed sign panels on sign structures using fastening hardware of the type and sizes shown.

Complete the CIDH concrete pile foundation at least 7 days before erecting the sign structure.

Plumb or rake posts as required by adjusting the leveling nuts before tightening nuts. Do not use shims or similar devices. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made and the structure is properly positioned, tighten nuts as follows:

1. Tighten leveling nuts and top nuts, following a crisscross pattern, until bearing surfaces of all nuts, washers and base plates are in firm contact.
2. Use an indelible marker to mark the top nuts and base plate with lines showing relative alignment of the nut to the base plate.
3. Tighten top nuts following a crisscross pattern:
 - 3.1. Additional 1/6 turn for anchor bolts greater than 1-1/2 inches in diameter.
 - 3.2. Additional 1/3 turn for other anchor bolts.

Replace the 5th paragraph of section 57-2.01B(3) with:

10-16-20

Timber and lumber treated with waterborne preservatives must be dried after treatment and have no visual evidence of preservative on the surface.

Replace the 7th paragraph of section 57-2.01B(3) with:

10-16-20

Manually applied wood preservative must comply with AWPAs Standard M4.

Delete the 2nd paragraph of section 57-2.01C(3)(a).

10-16-20

Replace the 3rd paragraph of section 57-2.01C(3)(a) with:

10-16-20

Chromated copper arsenate must not be used for handrails or other applications with possible direct exposure to the public.

Replace the introductory clause of the 7th paragraph of section 57-2.01C(3)(a) with:

10-16-20

For lumber treated with ammoniacal copper zinc arsenate, alkaline copper quaternary ammonium compound, or copper azole:

Replace the 3rd paragraph of section 57-2.01C(3)(b) with:

10-16-20

If treated timber is framed, cut, or bored after treatment, thoroughly swab each cut, gap, or hole with 2 applications of a preservative as specified in AWPAs Standard M4.

Delete the 2nd paragraph of section 57-2.02B.

10-16-20

Add to section 57-2.02B:

04-19-19

HDPE shims must be commercial quality.

Replace section 57-2.02C with:

10-18-19

57-2.02C Construction

Install lagging members 4 inches thick or less with a 3/8-inch gap between members. Install lagging members greater than 4 inches thick with a 1/2-inch gap between members.

Replace the table in the 4th paragraph of section 57-3.02C with:

10-19-18

Quality characteristic	Test method	Requirement
Density of concrete core (kg/m ³ , min)	ASTM D792	1,762
28-day compressive strength of concrete core (psi, min)	ASTM C579	5,000
Structural strength of shell: Tensile strength, tensile modulus (percent loss) Flexural strength, flexural modulus (percent loss)	ASTM D638 ASTM D790	Less than 10 after UV deterioration test specified for plastic lumber
Dry film thickness of coating (mils, min)	--	15
Color change of coating	ASTM D4587, Test Cycle 2	No visible color change when tested for 800 hours
Initial adhesion of coating (psi, min)	ASTM D4541, Test Method D, E, or F and Protocol 2	150
Decrease in initial adhesion of coating, decrease (percent)	ASTM D4541, Test Method D, E, or F and Protocol 2 ASTM D1183, Test Condition D ^a	No more than 10 following 2 exposure cycles

^aUse a low temperature phase at 4 ± 5 °F and high temperature phase at 140 ± 5 °F.

AA

59 STRUCTURAL STEEL COATINGS

04-15-22

Replace the 2nd paragraph in section 59-1.01D with:

10-19-18

Measure coating adhesion strength with a self-aligning adhesion tester under ASTM D4541, Test Method D, E, or F and Protocol 2.

Replace the 2nd paragraph of section 59-1.02C with:

10-19-18

Coatings selected for use must comply with the volatile organic compound concentration limits specified for the air quality district where the coating is applied. The undercoats and finish or final coats selected for use must be compatible with each other.

Add to section 59-1.03A:

04-15-22

Provide lighting under SSPC-Guide 12 during surface preparation, cleaning, painting, and inspection.

Replace the 4th through 6th paragraphs of section 59-1.03B with:

04-15-22

Do not apply paint if:

1. Freshly painted surfaces may become damaged by rain, fog, condensation, or moisture of any kind
2. Atmospheric temperature or relative humidity will not remain within the specified application conditions during the drying period
3. Steel surface temperature is less than 5 degrees F above the dew point

Repair or replace paint damaged by weather.

If authorized, you may perform cleaning and painting activities during inclement weather by creating artificial conditions to within the specified limits inside an enclosure. Air movement within enclosures must be adequate to meet the atmospheric conditions throughout the entire enclosure.

Replace section 59-1.03C(2) with:

04-15-22

59-1.03C(2) Pressure Rinsing

Pressure rinse to remove dust or deleterious material from surfaces using a pressure wash system with a minimum nozzle pressure of 1,160 psi. Keep the nozzle tip from 12 to 18 inches from the surface. The nozzle must have a maximum fan tip angle of 45 degrees.

Replace section 59-1.03C(3) with:

04-15-22

59-1.03C(3) Pressure Washing

Pressure wash to remove loosely adhered coatings and contaminants from surfaces. Use a pressure wash system with a nozzle pressure from 2,500 to 5,000 psi and a rotary tip.

Replace the 1st paragraph of section 59-1.03C(4) with:

04-15-22

Steam clean to remove dirt, grease, loose chalky paint, and other foreign material from surfaces under SSPC-SP 1. Steam temperature at the nozzle must be from 265 to 375 degrees F.

Replace the 1st paragraph of section 59-1.03C(5) with:

04-15-22

Blast clean surfaces to receive undercoat paint.

Replace the 9th paragraph of section 59-1.03D with:

04-15-22

Unless otherwise authorized, pressure rinse painted surfaces before applying the next coat for either of the following conditions:

1. 7 days or more have elapsed after the application of the most recently applied coat
2. Dust or deleterious material is present on the painted surface

Replace the 1st paragraph of section 59-2.01A(1) with:

04-15-22

Section 59-2 includes specifications for preparing and painting structural steel, except galvanized or thermal spray coated surfaces.

Add after the paragraph of section 59-2.01A(3)(a):

10-19-18

If requested by the Engineer, submit documentation from the coating manufacturer verifying the compatibility of the undercoats and finish or final coats selected for use.

Add to section 59-2.01A(3)(a):

04-15-22

Submit quality control reports for cleaning and painting activities within 2 business days of having performed work upon which reports are based.

Replace the 2nd paragraph of section 59-2.01A(3)(c) with:

04-15-22

Submit the work plan after attending the prepainting meeting and include:

1. Names of the painting contractor and any subcontractors to be used.
2. One copy of each current and applicable ASTM and SSPC specification and qualification procedure.
3. Coating manufacturer's guidelines and instructions for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel. Include testing methods and maximum allowable levels for soluble salts.
4. Materials, methods, and equipment to be used.
5. Proof of required SSPC-QP certifications. For work requiring SSPC-QP 1 or SSPC-QP 2 certification, include:
 - 5.1. List of all personnel who will perform surface preparation or paint application.
 - 5.2. Proof of CAS certifications, as required under (1) SSPC-QP 1, Mandatory Annex A and (2) the SSPC CAS Implementation Schedule in effect at the time of contract advertisement.
6. Methods to control environmental conditions.
7. Methods to protect the coating during curing, shipping, handling, and storage.
8. Rinse-water collection plan.
9. Detailed paint repair plan for damaged areas.
10. Procedures for containing blast media and water.
11. Examples of proposed daily quality control reports for testing, measurements, and documentation to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.
12. Description of enclosures and other methods for preventing release of overspray and new paint into the surrounding environment.
13. Procedures for constructing demonstration panels on existing steel surfaces.
14. Proposed schedule of inspection hold points.

Replace section 59-2.01A(4)(a) with:

04-15-22

59-2.01A(4)(a) General

59-2.01A(4)(a)(i) General

Reserved

59-2.01A(4)(a)(ii) Hold Points

Hold points are designated times that (1) provide safe access and (2) allow for quality assurance inspection of the work prior to proceeding to the next portion of the work.

Designate hold points:

1. Prior to start of cleaning
2. After completion of pressure washing
3. Prior to the start of blast cleaning
4. After completion of all cleaning work for any portion of a structure

5. Prior to each coating application
6. After completion of each coating application

Add additional hold points if requested by the Engineer.

Notify the Engineer a minimum of 24 hours prior to each hold point.

59-2.01A(4)(a)(iii) Demonstration Panels

Prepare demonstration panels on existing surfaces prior to starting surface preparation production work. Demonstration panels are regions on the existing structural steel surfaces that are prepared, cleaned, and painted for the purpose of demonstrating the methods, materials, and processes to be used during production work.

Demonstration panels must:

1. Represent the variety of the work to be performed.
2. Meet contract requirements for cleaning and painting structural steel
3. Be a total area of at least 50 square feet
4. Be kept accessible during production work, unless authorized

At least 25 square feet of the completed demonstration panels must demonstrate the complete coating system. The remaining demonstration panel areas must demonstrate a variety of partially completed stages of the coating system.

Obtain authorization of the demonstration panels before starting production work.

If authorized, demonstration panels, or portions thereof, may be incorporated into the production work.

Replace item 1 in the list in the 2nd paragraph of section 59-2.01A(4)(d)(ii) with:

04-15-22

1. Perform 3 adhesion tests per girder or 1,000 sq ft of painted surface, whichever is less. If less than 1,000 sq ft is painted in a work shift, perform 3 tests. If 2 or more locations fail adhesion requirements, the area represented by the tests is rejected. If 1 of the locations fails adhesion requirements, test 3 additional locations. If any of the additional locations fail, the area represented by the tests is rejected. Repair rejected areas by blast cleaning and repainting. Repair test locations meeting adhesion requirements by applying organic zinc-rich primer to the specified dry film thickness.

Replace the 2nd paragraph of section 59-2.01C(1) with:

04-15-22

You must provide enclosures for cleaning and painting structural steel. Enclosures must prevent release of overspray and new paint into the surrounding environment during paint application. Maintain atmospheric conditions inside enclosures within specified limits.

Replace the 2nd and 3rd paragraphs of section 59-2.01C(3)(b)(i) with:

04-15-22

After pressure washing or steam cleaning, spot blast clean painted surfaces having rust or foreign material remaining that would hinder bonding of new paint. If there is no bid item for spot blast cleaning, this is change order work. Spot blast clean surfaces under SSPC-SP 6. For small areas, the Engineer may allow cleaning under SSPC-SP 11.

Clean previously painted surfaces under SSPC-SP 2. Feather edges of remaining paint. Do not use pneumatic chipping hammers unless authorized.

Replace the 1st and 2nd paragraphs of section 59-2.01C(3)(b)(ii) with:

04-15-22

Blast clean steel surfaces to be coated with inorganic zinc under SSPC-SP 10. After blast cleaning, surfaces must have a dense, uniform, angular anchor pattern of 1.5 to 3.5 mils when measured under ASTM D4417.

Where shown, spot blast clean existing painted steel surfaces under SSPC-SP 6. After blast cleaning, surfaces must have a dense, uniform, angular anchor pattern of at least 1.5 mils when measured under ASTM D4417.

Replace the 4th paragraph of section 59-2.02C with:

04-15-22

Where described, apply final or finish coats after installation and excavation are complete. For steel soldier piles that have no exposed surfaces or when finish coats are not required, you may apply final coat before installation and erection.

Replace section 59-4.03C with:

04-15-22

59-4.03C Testing of Inorganic Zinc Coating

Reserved

Replace the 2nd paragraph of section 59-4.03D with:

04-15-22

The 1st finish coat color must match no. 24558 of AMS-STD-595. The 2nd finish coat color must match no. 24491 of AMS-STD-595.

Replace the 2nd paragraph of section 59-5.01D(3) with:

04-15-22

Bend test coupons under section 6.5 of SSPC-CS 23.00/AWS C 2.23M. Coupons must exhibit no cracking with lifting from substrate.

Replace the 5th through 7th paragraphs of section 59-5.01D(4) with:

04-15-22

Inspect surfaces for visual cleanliness under SSPC-SP 10 before applying coating.

Test coating thickness under section 6.3 of SSPC-CS 23.00/AWS C 2.23M. Perform 1 test for every 150 sq ft of coating and 1 test for each faying surface.

Perform cut testing under SSPC-CS 23.00/AWS C 2.23M. Perform 3 tests of 3 cuts for every 1,000 sq ft of coating. Surfaces must exhibit no peeling or delamination.

Replace the 3rd paragraph of section 59-5.03 with:

04-15-22

Blast clean surfaces under SSPC-SP 10. Surfaces must have a sharp, angular anchor pattern of from 2.5 to 4.0 mils. Reblast surfaces that rust or become contaminated before coating is applied.

3. Coordination with lane closures, Traffic Operations, and Construction Zone Enhanced Enforcement Program
4. Equipment used for bridge removal work
5. Removal of any utilities
6. Removal of any items to be salvaged and stored
7. Debris containment and collection plan
8. Personal protective equipment
9. Hazardous material handling, storage, and removal
10. Protocol for handling unexpected conditions
11. Protecting adjacent facilities and utilities
12. Lane closure schedule if applicable
13. Contingency plan if applicable

60-2.02A(4)(c) Quality Control

04-15-22

For bridge removal work plans signed by a registered engineer, the engineer signing the work plan must confirm the conditions at least 1 business day before the start of bridge removal activities by visual inspection. Discuss the condition of the structure with the Contractor's project superintendent and the Engineer at the site.

For bridge removal activities, the engineer signing the work plan must:

1. Be registered as a civil engineer in the State.
2. Have experience in bridge removal plan design or bridge removal construction inspection.
3. Be present at all times during bridge removal activities.
4. Ensure compliance with the authorized work plan.
5. Stop the operation if it is unsafe. Before resuming operations, submit a proposed revision to the authorized work plan to remedy the unplanned occurrence.
6. Prepare a daily removal report for removal activities. The report must describe work activities for each day and the condition of the remaining structure. The report must be sealed and signed by an engineer who is registered as a civil engineer in the State.

The engineer signing the work plan may assign a representative to perform the bridge removal activities specified above. The engineer signing the work plan must submit a letter that is sealed and signed certifying that the representative:

1. Is registered as a civil engineer in the State
2. Has experience in bridge removal plan design or bridge removal construction inspection
3. Is familiar with the authorized work plan
4. Will attend at least 1 job site visit with the Contractor's project superintendent and the Engineer to discuss the authorized work plan at least 1 business day before beginning the bridge removal activities

Replace section 60-2.02B with:

04-19-19

60-2.02B Materials

Design criteria for temporary support shoring and temporary bracing must comply with section 48-3.02B.

Add to section 60-3.01A:

10-19-18

If you are unable to complete bridge reconstruction activities before the bridge is to be opened to traffic, furnish and maintain temporary decking under section 48-4 until that portion of the work is complete.

04-15-22

Where shown, (1) repair and prepare surfaces and (2) apply deck treatments and overlays to approach slabs as specified for concrete bridge deck surfaces.

Add to the beginning of section 60-3.02C(1):

04-15-22

Protect existing drain inlets, joint seals, joint seal assemblies, and other facilities to be incorporated into the new work from damage.

Replace the 3rd and 4th paragraphs of section 60-3.02C(3) with:

04-19-19

Remove asphalt concrete surfacing by cold milling under the following conditions:

1. If a membrane seal is shown:
 - 1.1. Remove the seal by cold milling
 - 1.2. Do not remove more than 1/2 inch of the existing concrete slab

2. If a membrane seal is not shown:
 - 2.1. Remove asphalt concrete surfacing until a 1/2-inch minimum of surfacing remains on top of existing concrete slab
 - 2.2. Use other authorized means to remove the remaining asphalt concrete without damage to the concrete slab

Add to section 60-3.02C(3):

04-19-19

Where a portion of the asphalt concrete surfacing is to remain, saw cut a 2-inch-deep true line along the edge to remain in place before removing asphalt concrete. Remove the asphalt concrete without damaging the surfacing to remain in place.

Replace section 60-3.02C(8) with:

04-15-22

60-3.02C(8) Remove Polyester Concrete Overlay

Remove polyester concrete overlay by micro milling.

Before removing the overlay, verify the depth of polyester concrete at supports and midspan of each structure:

1. In each shoulder
2. In the traveled way
3. At the roadway crown, if a crown is present

Remove no more than 1/8 inch of the underlying concrete surface.

Remove residual polyester concrete remaining on the surface after micro milling by other authorized means. Do not damage the underlying concrete.

Replace item 3 in the list in the 9th paragraph of section 60-3.04B(1)(d) with:

10-15-21

3. RSC using hydraulic cement other than portland cement or portland limestone cement no sooner than 3 days after concrete placement and your test results for prequalification of RSC show that the concrete attained at least 3,500 psi compressive strength

Delete the 3rd paragraph of section 60-3.04B(3)(a).

Replace the 9th paragraph of section 60-3.04B(3)(c) with:

Protect the overlay from moisture and do not allow traffic or equipment on the overlay (1) for a minimum of 4 hours cure time after final finishing and (2) until each rebound test result for the final finish shows a reading of at least 28 when tested under ASTM C805. The cure time must be extended if ordered. The rebound test may not be used to reduce the 4-hour cure time of the overlay.

Replace section 60-3.05E with:

60-3.05E Galvanic Anodes

Reserved

Replace section 60-3.05F with:

60-3.05F Replace Bearings

60-3.05F(1) General

Section 60-3.05F includes specifications for replacing bearing pads or steel rocker bearings with elastomeric bearing pads.

Elastomeric bearing pads must comply with section 51-3.02.

Temporary supports must comply with section 48-3.

Jacking must comply with section 48-5.

60-3.05F(2) Materials

Not Used

60-3.05F(3) Construction

Temporary supports must include jacking assemblies required to jack and support the imposed loads and structures. Temporary or permanent stiffening members are required at all girder locations, directly above the applied jacking forces, unless otherwise authorized.

When the bridge is in the raised position, do not allow traffic on the bridge until the structure is secured and fully supported by temporary supports.

Remove the existing bearing pads and steel rocker bearings under section 60-2.02, except a bridge removal work plan is not required.

For steel rocker bearings, remove the existing steel keeper plates, steel masonry plates, grout pads, anchor bolts and rocker bearings. Flame or air-arc type of cutting equipment is not allowed to remove existing keeper plates. Sharp, marred, or roughened corners and edges resulting from removal operations must be slightly rounded by grinding or other suitable means.

Steam clean existing bearing seats and bearing contact areas on the bottoms of concrete girders to remove waxy residue and other deleterious materials.

Use oil-free compressed air for final cleaning to remove all loose material from bearing contact areas before placing new elastomeric bearing pads.

Verify bearing surface of seats are level. Ensure equal bearing on the entire area of each pad.

60-3.05F(4) Payment

Not Used

Replace the 1st paragraph of section 60-4.06A(4) with:

04-16-21

For field welding of column casings:

1. Only visual inspection is required
2. 2nd sentence of clause 5.13.2 and the 1st sentence of clause 5.13.3 of AWS D1.5 do not apply

Replace the 10th paragraph of section 60-4.09B(2)(a) with:

10-19-18

Steel parts must comply with ASTM A36/A36M or A576, Grade 1030 and must not be rimmed or capped steel.

Replace section 60-4.10 with:

10-16-20

60-4.10 BRIDGE SEAT EXTENDERS FOR RETROFITS

60-4.10A General

60-4.10A(1) Summary

Section 60-4.10 includes specifications for fabricating and installing bridge seat extenders.

Bridge seat extenders must comply with the specifications for miscellaneous bridge metal in section 75-3.

60-4.10A(2) Definitions

Reserved

60-4.10A(3) Submittals

Submit a work plan showing the method of grouting pipe seat extenders to prevent grout from entering the hinge area.

60-4.10A(4) Quality Assurance

Inspect bridge seat extender materials at the fabrication site.

Notify the Engineer:

1. When materials have been delivered to the fabrication site
2. At least 10 days before starting fabrication

60-4.10B Materials

60-4.10B(1) General

Reserved

60-4.10B(2) Pipe Seat Extenders

Pipe seat extenders must consist of double extra-strong steel pipes, HS threaded rods, nuts, and washers.

Double-extra strong steel pipe must comply with ASTM A53/A53M, Grade B. HS threaded rods, nuts, and washers must comply with section 55-1.02D(1).

Galvanize double-extra strong steel pipe under section 75-1.02B. After galvanizing, any alterations resulting in new exposed surfaces, including holes or cut ends, must be coated as specified for repairing damaged galvanized surfaces under section 75-1.02B.

Grout for bonding the pipe to the cored hole must comply with section 60-4.06B(2). Any filler materials or seals must not restrict joint movement.

60-4.10B(3) Slab Bridge Seat Extenders

Slab bridge seat extenders must consist of steel plates, support tubes, bolts, bars, nuts, washers, pins, and elastomeric bearing pads.

Slab bridge seat extender must comply with section 55. Elastomeric bearing pads must comply with section 51-3.02. The support tubes must comply with ASTM A500/A500M, Grade B.

Galvanize seat extender under section 75-1.02B. After galvanizing, any alterations resulting in new exposed surfaces, including holes or cut ends, must be coated as specified for repairing damaged galvanized surfaces under section 75-1.02B.

Epoxy mortar must consist of a mixture of epoxy binder and aggregate. The epoxy mortar must comply with section 95-1.02C. The mix proportions of epoxy mortar must be 1-part binder to 1-part aggregate by volume. Aggregate must consist of a combination of 1-part material passing the no. 30 sieve and 3-parts material passing the no. 20 sieve.

60-4.10C Construction

60-4.10C(1) General

Reserved.

60-4.10C(2) Pipe Seat Extenders

Reserved

60-4.10C(3) Slab Bridge Seat Extenders

Place epoxy mortar under section 95-1.03.

Place elastomeric bearing pads under section 51-3.02C. Bond elastomeric bearing pads to steel support tubes with adhesive complying with Federal Specification MMM-A-121.

60-4.10D Payment

The payment quantity for seat extender does not include the weight of nonmetallic materials used in constructing the seat extenders.

Replace section 60-4.11 with:

10-15-21

60-4.11 REPLACE ACCESS DOORS

60-4.11A General

60-4.11A(1) Summary

Section 60-4.11 includes specifications for replacing access doors.

Replacing access doors includes (1) removing an existing recessed access door with hinges, and (2) installing a new access door with frame.

60-4.11A(2) Definitions

Reserved

60-4.11A(3) Submittals

Submit 3 copies of access door assembly shop drawings for each location requiring a new access door assembly. Shop drawings must include:

1. Name of fabricator
2. Field measurement of the height, width, and wall thickness
3. Details for temporary metal covers including connections or fasteners to be used

Concrete and joint seals must comply with section 51.

Sealant must comply with section 41-5.

Reinforcement must comply with section 52.

Underdrain must comply with section 68-2.

Miscellaneous metal must comply with section 75.

Cable railing must comply with section 83-2.07.

62-1.01B Definitions

Reserved**62-1.01C Submittals**

At least 5 business days before placing permeable material, submit a certificate of compliance for the gradation of the material from the source.

No more than 5 business days after placing permeable material, submit:

1. At least one ASTM D6913 test on permeable material sampled at:
 - 1.1. Job site
 - 1.2. Authorized location
2. Verification that the permeable materials testing results meet the gradation requirements

62-1.01D Quality Assurance

Submit verification that the placed material complies with the gradation for the Class 4 and Class 5 permeable materials.

Submit verification of the uniformity coefficient for Class 5 permeable material.

For Department acceptance, the depth of the permeable material will be measured after the in-place washing is complete.

62-1.02 MATERIALS

62-1.02A General

Not Used

62-1.02B Class 4 Permeable Material

Class 4 permeable material must consist of sand, gravel, or crushed stone that is hard, durable, and clean. The material must be free from organic material, clay balls, or other deleterious substances.

The percentage composition by weight of Class 4 permeable material in place must comply with the gradation requirements shown in the following table:

Sieve size	Percentage passing
2"	100
1-1/2"	95-100
3/4"	50-100
3/8"	15-55
No. 4	0-25
No. 8	0-5
No. 100	0

Class 4 permeable material must have a durability index of not less than 40.

62-1.02C Class 5 Permeable Material

Reserved

62-1.02D Miscellaneous Metal

Fabricate the parts shown in the table below from the corresponding materials shown:

Miscellaneous Metal Parts

Part	Material
Ladders	Steel
Handrails	Steel
Trash screen	Steel
Components of riser support brackets	Stainless steel complying with ASTM A276, Grade 304 CIP inserts must be ferrule loop type

62-1.02E Filter Fabric

Class D filter fabric must comply with the requirements shown in the following table:

Class D Filter Fabric

Quality characteristic	Test method	Requirement
Permittivity (min and max, sec ⁻¹)	ASTM D4491	1.6–1.8
Apparent opening size, average roll value (min and max, US standard sieve size)	ASTM D4751	60–80
Grab breaking load, 1-inch grip, in each direction (min, lb)	ASTM D4632	120
Apparent elongation, in each direction (min, %)	ASTM D4632	50
UV resistance, retained grab breaking load, 500 hours (min, %)	ASTM D4355	70

62-1.02F–62-1.02I Reserved

62-1.03 CONSTRUCTION

62-1.03A General

Placing filter fabric must comply with section 68-1.03B.

62-1.03B Permeable Material

62-1.03B(1) General

04-16-21

Before placement, wash Class 4 and Class 5 permeable materials:

1. To remove silt and clay particles
2. With potable water equal to at least 4 times the volume of the material being placed

After placement, wash Class 4 and Class 5 permeable materials:

1. With potable water
2. Until the discharged water has a turbidity reading of:
 - 2.1. 30 NTU or less for a project within the Tahoe Hydrologic Unit
 - 2.2. 200 NTU or less for a project outside the Tahoe Hydrologic Unit

04-17-20

Capture the wash water. Handle the wash water by any of the following means:

1. Dispose of
2. Use as dust control
3. Disperse onsite in an authorized location other than the BMP

62-1.03B(2) Class 5 Permeable Material

Place Class 5 permeable material:

1. In a way that does not damage or displace the filter fabric
2. Using methods that produce a finished surface as shown

62-1.03C–62-1.03H Reserved

62-1.04 PAYMENT

Not Used

62-2 DESIGN POLLUTION PREVENTION INFILTRATION AREA

Reserved

62-3 INFILTRATION TRENCH

04-16-21

62-3.01 GENERAL

62-3.01A Summary

Section 62-3 includes specifications for constructing infiltration trenches.

Concrete curb must comply with section 73.

62-3.01B Definitions

Reserved

62-3.01C Submittals

At least 5 business days before placing permeable material, submit a certificate of compliance for the gradation of the material from the source.

62-3.01D Quality Assurance

Reserved

62-3.02 MATERIALS

62-3.02A General

Filter fabric must be Class D.

62-3.02B Surface Gravel

Surface gravel must be Class 1, Type A permeable material under section 68-2.02F.

62-3.02C Trench Filler Material

Trench filler material must be Class 6 permeable material and must consist of rock or high porosity backfill material. Rock must be non-crushed, pre-washed, clean, hard, sound, durable, and uniform in quality. Rock must be free of detrimental quantity of soft, friable, thick elongated or laminated pieces, organic material, clay balls, oil, alkali, or other deleterious substances.

The percentage composition by weight of Class 6 permeable material in place must comply with the gradation requirements shown in the following table:

Sieve size	Percentage passing
4"	100
3"	75
2"	8
1.5"	2

Class 6 permeable material must have a minimum durability index of not less than 40.

62-3.02D Observation Well

PVC pipe for the observation well must be perforated, have a smooth wall, and comply with AASHTO M278.

PVC matted end cap and vented well cap must comply with AASHTO M278.

Concrete must be minor concrete.

Pull box must comply with section 86-1.02C, except an electronic marker is not required. The cover marking must be *OBSERVATION WELL*.

62-3.02E Alternative Trench Filler Material

Reserved

62-3.03 CONSTRUCTION

62-3.03A General

Place filter fabric under section 68-1.03B.

62-3.03B Observation Well

The only joint allowed in the pipe in the observation well is between the perforated and solid wall pipe sections.

Place the observation well pipe vertically.

No permeable material, sand, or other material must be inside the well pipe.

62-3.04 PAYMENT

Not Used

04-17-20

62-4 INFILTRATION BASIN

Reserved

62-5 INFILTRATION GALLERY

Reserved

62-6 RESERVED

62-7 BIORETENTION

Reserved

62-8 DETENTION BASIN

Reserved

62-9 AUSTIN EARTH BERM

Reserved

62-10 AUSTIN VAULT SAND FILTER

Reserved

62-11 DELAWARE SAND FILTER

Reserved

62-12 GROSS SOLIDS REMOVAL DEVICE

04-16-21

62-12.01 GENERAL

Section 62-12 includes specifications for constructing gross solids removal devices.

62-12.02 MATERIALS

62-12.02A General

Reserved

62-12.02B Miscellaneous Metal

Fasteners used to connect grates and screen to the frame must be vandal-resistant.

Stainless steel wedge-wire screens, plates, and bars must comply with ASTM A240/ A240M, Type 304, with a no. 2B finish.

Finished screens must be descaled by immersion in a nitric/hydrofluoric acid bath, rinsed, and air dried to achieve passivation.

Fasteners, anchorage devices, hardware for the inclined screen and screened pipe must be Type 304 stainless steel.

Welding of steel members must comply with AWS D1.1, D1.4, and D1.5. Welding of stainless steel members must comply with AWS D1.6.

Before welding, prepare and clean with stainless steel brushes and non-ferrous abrasives. Equipment used in the fabrication of carbon steel must not be used.

After welding, the stainless steel surface must be smooth and without waves.

Fabricate the parts shown in the table below from the corresponding materials shown:

Miscellaneous Metal Parts	
Part	Material
Jet plate	Steel
Deflector	Steel
Cleanout	Steel or Type 304 stainless steel
Chain	Steel

62-12.02C Fiberglass Reinforced Plastic Components

Reserved

62-12.02D Inclined Screen

Inclined screen must be stainless steel wedge wire.

The screen slot width must be between 0.17 to 0.20 inch.

Stainless steel wedge wire screen must have an open area from 60 to 70 percent of the total screen area.

62-12.02E Screened Pipe

Screened pipe, joints, supports, hatches, doors and ancillary hardware must be constructed of stainless steel. Screened pipe must comply with ASTM A778, and must be Type 316L.

Screened pipe must be 0.25-inch thick well screen with machine-made evenly spaced louvered openings perpendicular to the axis of the casing. Fabricate screened pipe with perforations and louvers as shown.

Fabrication tolerances on the screened pipe, joints, hatches, and doors must not exceed 0.20 inch.

Screened pipe sections must be joined after fabrication. Sections must be numbered using a metal tagging system after compatibility matching, with the tag indicating project location and section number. Section numbering must indicate the placement at each location, with the non-louvered section being labeled as the first section and continuing sequentially until the final section for each location. The metal tags must remain in place after installation.

62-12.02F Frame and Grates

Frames and grates for linear radial gross solids device must be steel.

Each grate section must be readily removable where shown. Frame and grate supports must be provided at openings and must clear ladders and other access points. Grate openings that fit around protrusions such as pipes and ladders must be discontinuous at approximately the centerline of opening so that each section of grate is easily removable.

62-12.03 CONSTRUCTION

Installation of inclined screens and supports, jet plates, and ancillary features must comply with sections 55-1.02E(6)(c) and 55-1.02E(7).

Install inclined screen, screened pipe, joints, hatches, doors, supports, and ancillary features such that gaps do not exceed 0.20 inch.

Pipe and fittings must be manufactured from virgin compounds. Reworked plastic may be used if it meets the requirements for rework plastic conforming to ASTM F2881.

Pipe must be colored or black. Carbon black content must be from 2 to 3 percent by weight for black pipe. Add UV stabilizers for colored pipe under the manufacturer's instructions.

Gaskets must be elastomeric and comply with ASTM F477. No reworked material will be allowed in the manufacture of the gasket. Gasket must be covered with a removable, protective wrap to ensure the gasket is free from debris.

All pipes and fittings must be clearly marked with:

1. Manufacturer's name or trademark
2. Nominal size
3. Specification designation
4. Plant location or designation code
5. Date of manufacture

Pipe must be marked at intervals of not more than 12 feet.

Store pipe and fittings above ground on adequate blocking. Pipe must be kept clean and fully drained during storage. Pipe, fittings, and gaskets must be covered or wrapped if exposed to sunlight during storage.

Replace section 64-2.02F with:

10-15-21

64-2.02F Joints

Plastic pipe joints must comply with section 61-2.01D(2)(b) for standard or positive joints. Where sleeve joint connections are used, the sleeve width must be at least 7-3/4 inches and engage at least 2 corrugations of each pipe being joined.

Joints for pipes shown as watertight must be watertight under pressure and all conditions of expansion, contraction, and settlement, and must comply with section 61-2.01D(2)(a) for watertightness.

For corrugated polyethylene pipe:

1. If watertight joints are shown, use Type S corrugated polyethylene pipe with gaskets. If watertight joints are not shown, use gasketed joints when specified. Gaskets for Type C corrugated polyethylene pipe must be installed on each side of the joint. Gaskets must comply with ASTM F477 and be factory-installed.
2. Corrugated polyethylene pipe joints manufactured to comply with section 61-2.01D(2)(b) for integral joints must be laid to line and grade with sections closely jointed. Corrugated polyethylene pipe to be joined by sleeve joints must be laid to line and grade with the separate sections not more than 1-1/2 inches apart and then firmly joined together with at least 2 corrugations from each pipe section engaged in the coupler.

For corrugated PVC pipe with smooth interior:

1. Elastomeric gaskets must comply with ASTM F477 for low-head applications. Use extruded or molded gaskets cured in a way so that any cross section will be dense, homogeneous, and free of pores, blisters, pitting or other imperfections. Double gaskets must be single-piece gaskets that fit into the first 2 full corrugation valleys on the spigot end. Ship gaskets in containers that will prevent damage from UV exposure and handling.
2. Wyes, tees, reducers, elbows, couplings, laterals, and other fittings must be molded or fabricated under ASTM F949 for cell classification 12454 or 13343 as specified in ASTM D1784.
3. Lubricant must comply with the pipe manufacturer's instructions. The lubricant must not have a detrimental effect on gaskets or pipes.
4. Joints must comply with section 61-2.01D(2)(b) for integral joints except the joint overlap requirements are as shown. Pipe joints must be bell and spigot type with gaskets ready for field

assembly. Install joints so that the elastomeric gasket will be compressed radially between the pipe bell and spigot to form a tight seal when assembled.

For polypropylene dual wall pipe:

1. All joints must be watertight unless otherwise described
2. Joints must comply with ASTM D3212 and be bell and spigot type unless alternative connections are shown
3. Gaskets must be installed at all joints
4. Lubricant used for the assembly of the gasketed joint must be as recommended by the pipe manufacturer with no detrimental effect on the gasket or pipe
5. Install joints so that the elastomeric gasket will be compressed radially between the pipe bell and spigot to form a tight seal when assembled

Replace the 2nd paragraph of section 64-2.03A with:

10-15-21

Install Type S corrugated polyethylene pipe, corrugated PVC pipe, or polypropylene dual wall pipe wherever smooth interior wall type is shown.

Replace item 2 in the list in 1st paragraph of section 64-2.03B with:

10-15-21

2. Backfill corrugated polyethylene pipe or polypropylene dual wall pipe greater than 48 inches in nominal diameter with either controlled low-strength material under section 19-3.02G or with slurry cement backfill under section 19-3.02E.

Replace item 3 in the list in the 1st paragraph of section 64-2.03B with:

04-16-21

3. Place controlled low-strength material used for structure backfill to a level at least 12 inches or 0.7 times the pipe diameter above the pipe crown, whichever is greater.

Add to the end of section 64-2.03C:

10-15-21

Place polypropylene dual wall pipe under the manufacturer's instructions except corrugated couplings must be split collar, engaging at least 2 full corrugations when non-watertight joints are allowed. Shortening pipe sections in the field must comply with the manufacturer's instructions.

AA

65 CONCRETE PIPE

10-15-21

Replace the 2nd paragraph of section 65-2.01D(3) with:

10-16-20

Pipes 24 inches in nominal diameter and smaller do not need to be tested to the load to produce a 0.01-inch-wide crack if the pipe is subjected to a load equivalent to the ultimate test load and complies with section 65-2.02. Instead of broken pipe pieces obtained as specified above, cores weighing at least 2.2 pounds from pipe sections selected by the Engineer may be used for the absorption test. Pipe sections that have been tested to the actual 0.01-inch-wide crack will not be load-tested further, and those sections that comply with or exceed the required strength and workmanship standards may be used in the work if authorized.

Replace the 2nd paragraph of section 65-2.01D(5) with:

10-16-20

Oval shaped reinforced concrete pipe 24 inches in nominal diameter and smaller does not need to be tested to the load to produce a 0.01-inch-wide crack if the pipe is subjected to a load equivalent to the ultimate test load and complies with section 65-2.02. Instead of broken pipe pieces obtained as specified above, cores weighing at least 2.2 pounds from pipe sections selected by the Engineer may be used for the absorption test. Pipe sections that have been tested to the actual 0.01-inch-wide crack will not be load-tested further, and those sections that comply with or exceed the required strength and workmanship standards may be used in the work if authorized.

Replace the 2nd paragraph of section 65-2.02A with:

10-16-20

The concrete for reinforced concrete pipe must contain at least 470 pounds of cementitious material per cubic yard and have a water to cementitious material ratio that does not exceed 0.40 by weight. You may use SCM. Circumferential reinforcement must have a minimum cover of 1 inch, except pipes with a nominal diameter of 18 inches or less must have a minimum cover of 3/4 inch.

Replace item 1 in the list in the 3rd paragraph of section 65-2.02F with:

10-15-21

1. Cement mortar composed of 1 part portland cement or portland limestone cement and 2 parts sand by volume and the following:
 - 1.1 Well graded sand passing a no. 8 sieve.
 - 1.2 Mix materials to a consistency suitable for the purpose intended. Use the mortar within 30 minutes after you add the mixing water.
 - 1.3 You may use admixtures of hydrated lime, fire clay, diatomaceous earth, or other authorized inert material in the mortar to facilitate workability. Obtain authorization for the quantity of admixture.

Replace the 4th paragraph of section 65-2.03C with:

10-15-21

Do not allow free water to come in contact with the pipeline until portland cement or portland limestone cement sealing materials have set at least 24 hours.

^^

66 CORRUGATED METAL PIPE

10-19-18

Replace the 1st paragraph in section 66-1.02D with:

10-19-18

Coupling bands for corrugated metal pipe must comply with either section 66-1.02D or section 61-2.01D(2)(b).

Replace the 6th paragraph in section 66-1.02D with:

10-19-18

Joints for siphons and joints for pipes shown as watertight must be watertight under pressure and all conditions of expansion, contraction, and settlement, and must comply with section 61-2.01D(2)(a) for watertightness.

68-8.01D Quality Assurance

68-8.01D(1) General

Reserved

68-8.01D(2) Quality Control

Reserved

68-8.01D(3) Department Acceptance

68-8.01D(3)(a) General

Reserved

68-8.01D(3)(b) Verification Testing

Do not start installation until the verification test is accepted.

Install 2 prefabricated vertical drains at locations determined by the Engineer. Use the same equipment and method to be used for installation. Perform verification tests in the Engineer's presence.

The verification test must demonstrate that the proposed equipment and method can install prefabricated vertical drains to the depth shown.

The Department rejects verification tests that fail to install prefabricated vertical drains to the depth shown. Submit revised shop drawings for additional verification tests. Repeat verification testing until the results demonstrate that the proposed equipment and method can install prefabricated vertical drains to the depths shown.

68-8.01D(3)(c) Acceptance Testing

Reserved

68-8.02 MATERIALS

Prefabricated vertical drains must consist of a polymeric core with filter fabric integrally bonded to both sides of the core creating a stable drainage void. Prefabricated vertical drains must be free of defects, rips, or holes.

Identify prefabricated vertical drain rolls under ASTM D4873. Label or tag must include lot or control numbers, individual roll number, date of manufacture, manufacturer, and product identification.

Prefabricated vertical drains must comply with the requirements shown in the following table:

Prefabricated Vertical Drains

Quality characteristic	Test method	Requirement
Total discharge capacity @ 72 psi and unit hydraulic gradient (min, gallon per minute)	ASTM D4716	1.6
Tensile strength (min, lb)	ASTM D4595	225
Nonwoven geotextile of prefabricated vertical drains		
Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	212(70)
Permittivity (min, sec ⁻¹)	ASTM D4491	0.3
Grab tensile strength (min, lb)	ASTM D4632	112
Puncture strength (min, lb)	ASTM D6241	125
Trapezoidal tear (min, lb)	ASTM D4533	55

68-8.03 CONSTRUCTION

Handle and store prefabricated vertical drains under the manufacturer's instructions and ASTM D4873. During shipment and storage, the prefabricated vertical drains must be wrapped in a heavy-duty protective covering. Store and protect prefabricated vertical drains from sunlight, mud, dirt, dust, debris, and detrimental substances.

Before installation, survey, mark, and label the prefabricated vertical drain locations as shown. Install prefabricated vertical drains within 6 inches from the locations shown.

Install prefabricated vertical drains from the working surface and to the tip elevation shown.

Equipment for installing prefabricated vertical drains must:

1. Be plumbed with deviation from vertical less than 1 in 50 during installation of the prefabricated vertical drains.
2. Be able to advance through the soil at the job site to the design tip elevation.
3. Have a cross-sectional area of the driving sleeve or mandrel combined with the anchor less than 10 square inches.
4. Have a driving sleeve or mandrel that can protect the prefabricated vertical drain material from tears, cuts, and abrasions during installation.

Advance the driving sleeve or mandrel at a constant force or constant rate.

Protect prefabricated vertical drains from tears, cuts, and abrasions during installation. Anchor the tip of each prefabricated vertical drains with a rod or anchor plate.

You may end the prefabricated vertical drain at an elevation within 8 feet of the design tip elevation.

Do not use jetting or impact method.

If authorized, you may use auger or vibrator to loosen and penetrate stiff upper soil layers before installing prefabricated vertical drains. Auger holes must be 6 inches or less in diameter and extend less than 12 inches past the obstruction. Backfill the auger hole with sands immediately after installation of each prefabricated vertical drain.

Cut installed prefabricated vertical drains neatly with at least 12 inches protruding above the working surface.

Do not damage previously installed prefabricated vertical drains.

You may splice prefabricated vertical drains. Spliced section of prefabricated vertical drains must have the same or better structural and hydraulic properties than prefabricated vertical drains without splice. Place the end of the trailing roll of prefabricated vertical drains inside the geotextile covering of the existing roll. Overlap each end of prefabricated vertical drains with geotextile covering at least 8 inches.

Prefabricated vertical drains that are out of plumb, out of location, damaged, or improperly installed are rejected. Install 2 additional prefabricated vertical drains for each rejected prefabricated vertical drain 2 feet away from the rejected prefabricated vertical drain and at locations determined by the Engineer.

68-8.04 PAYMENT

Not Used

AA

70 MISCELLANEOUS DRAINAGE FACILITIES

04-15-22

Replace item 1 in the list in the 1st paragraph of section 70-5.02B(2) with:

1. Cement and aggregate must comply with section 90-1 except for the aggregate gradation requirements

10-15-21

Replace the 5th paragraph of section 70-7.02C with:

04-15-22

Clevis plate, expansion anchors, yoke, rod, pipe clamps, nuts and bolts, and other fittings must be steel and comply with section 75-1.

For pipeliners with a stiffness of less than 29 psi, the grout pump's pressure measured at the point of injection must not exceed either of the following:

1. 5 psi
2. Manufacturer's instruction

For pipeliners with a stiffness of at least 29 psi, the grout pump's pressure measured at the point of injection must not exceed 7.25 psi.

The pipeliner must be able to withstand a static head of grout that is 6 inches above the highest crown elevation. The maximum grout pressure for a static grout head must not exceed the grout pump's maximum allowable pressure.

Install a grout pressure gauge and recorder immediately adjacent to each injection port. Continuously record on paper with ink the actual grouting pressure versus time. Record grout pressure to an accuracy of ± 0.5 psi. Attach a gauge to a saddle-type diaphragm seal to prevent clogging with grout.

71-3.01A(4)(c)(iii) CCTV Recording

CCTV recordings must be made and submitted in high quality electronic media such as CD or DVD.

The CCTV equipment must include:

1. CCTV camera with articulating head
2. Transporter adapted for conditions of the culvert
3. Television monitor
4. Lighting
5. Cables and power sources

CCTV equipment must:

1. Be specifically designed and constructed for pipe inspection
2. Have camera lighting for minimizing reflective glare
3. Have an adjustable focal-distance range from 6 inches to infinity
4. Produce a minimum resolution of 356 lines per inch for both the camera and monitor
5. Have a remote-reading meter counter accurate to 1 percent over the length of the particular section being inspected

Verify the accuracy of the distance meter in the CCTV with a walking meter, roll-a-tape, or other authorized device.

Where human entry is possible for the entire length of the culvert, you may use a handheld video camera with lighting as an alternative to CCTV. Video and audio content must comply with the requirements for CCTV. Inspect at a rate that is not more than 30 feet per minute.

71-3.01A(4)(c)(iv) Photographs

Use a digital camera and lighting. Lighting and photo quality must be suitable to provide clear and focused photographs of the entire culvert surface under all conditions.

71-3.01A(4)(c)(v) Monitoring of Annular Space Grouting

Wherever a pipeliner with annular space grouting is described, monitor the grouting and record pressures throughout the grouting process. Verify compliance with the manufacturer's instructions for each phase of the grouting process. Gauges must comply with ANSI B40, Grade 2A. The pressure gauges, recorder, and field equipment must be calibrated by an independent testing agency.

71-3.01A(4)(c)(vi) Pipeliners

Pipeliners must be continuous over the entire length of the culvert and must have no visual defect such as foreign inclusions, concentrated ridges, discoloration, pitting, pin holes, cracking or other deformities. The pipeliner must not be over-deflected. There must not be segregation or voids in the grout.

DIVISION VIII MISCELLANEOUS CONSTRUCTION

72 SLOPE PROTECTION

04-15-22

Delete the 1st paragraph of section 72-2.03A.

10-15-21

Delete the 1st paragraph of section 72-3.03A.

10-15-21

Replace the 7th paragraph of section 72-5.03 with:

10-15-21

Spread and tamp concrete until it is thoroughly compacted and mortar flushes to the surface. If the slope is too steep to allow the use of concrete wet enough to flush with tamping, tamp concrete until it is consolidated and immediately trowel on a mortar surface that is 1/4 inch thick. The mortar must consist of 1 part portland cement or portland limestone cement and 3 parts fine aggregate.

Replace the 2nd paragraph of section 72-11.01C(2) with:

10-15-21

Spread and tamp concrete until it is thoroughly compacted and mortar flushes to the surface. If the slope is too steep to allow the use of concrete wet enough to flush with tamping, tamp the concrete until it is consolidated and immediately trowel on a mortar surface that is 1/4 inch thick. The mortar must consist of 1 part portland cement or portland limestone cement and 3 parts fine aggregate.

Replace section 72-11.03B(3) with:

04-15-22

72-11.03B(3) Mortar

Cement must comply with section 90-1.02B(2).

Hydrated lime must comply with ASTM C207, Type S.

Mortar sand must be commercial quality and free of organic impurities and lumps of clay and shale.

Mortar must consist by volume of 1-part cement, from 0 to 0.5 part hydrated lime, and from 2.25 to 3 parts mortar sand. Add enough water to make a workable mortar. Accurately measure and thoroughly mix each batch of mortar. Do not retemper mortar more than 1 hour after mixing.

Reduce the amount of lime as necessary to prevent leaching and efflorescence on the finished surface.

You may use a premixed packaged mortar blend of cement, lime, and sand, without color, that requires only water to prepare for use as mortar. Packages of the premixed mortar must show the manufacture's name, brand, weight, and color identification.

Add to section 72-11:

04-15-22

72-11.04 SLOPE PAVING WITH ROCK COBBLE

72-11.04A General

72-11.04A(1) Summary

Section 72-11.04 includes specifications for constructing slope paving using rock cobbles on mortar beds.

72-11.04A(2) Definitions

Reserved

72-11.04A(3) Submittals

Submit 2 samples of the rock cobble at least 15 days before placing the rock cobble surface of the slope paving.

If using premixed mortar, submit the manufacturer’s instructions for the mixing proportions and procedures.

72-11.04A(4) Quality Assurance

Reserved

72-11.04B Materials

72-11.04B(1) General

Reserved

72-11.04B(2) Rock Cobble

Rock used for the slope paving with rock cobble must be clean and smooth rock obtained from a single source. Flat or needle shapes must not be used unless the thickness of the individual pieces are greater than 1/3 the length.

Rock must be mostly tan, but include a variety of colors including red, rose, brown, gray, and light gray river rock cobble.

Rock used for the slope paving with rock cobble must conform to the following gradation:

Screen size (in)	Percentage passing
8	100
6	50–85
4	0–50

72-11.04B(3) Mortar

Mortar must comply with section 72-11.03B(3).

72-11.04C Construction

72-11.04C(1) General

Protect surfaces of completed rock cobble, concrete, and other materials on the exposed surface from spillage, splatters, and other deposits of cementitious materials from rock cobble construction. Remove these deposits without damage to the materials or exposed surfaces.

Stains, efflorescence, laitance, splashes, or spots on the faces of rock cobble exposed to view must be removed.

72-11.04C(2) Installation on a Mortar Bedding

The top surface of the shotcrete or concrete base must be lightly and evenly scored horizontally and vertically with a metal scratcher having grooves not more than 1 inch apart.

Cure the shotcrete or concrete base by the water method for at least 2 days before placing rock cobbles.

Clean concrete areas to be in contact with mortar of loose or foreign material that would prevent bonding between the mortar and the concrete surfaces. Flush the concrete areas with water and allow them to dry to a surface-dry condition immediately before placing mortar.

Lay and embed rock cobble in mortar. Rock cobble must be tightly seated so the mortar is flushed into the joints. Excess mortar must be removed.

After the rock cobbles have been set in the mortar, exposed top surfaces must be thoroughly cleaned.

Unless authorized, the clear distance between placed rock cobbles must not exceed 1-1/2 inches.

Loose rocks must be reset.

Cure mortar by keeping the surface damp for 3 days.

Replace section 78-4.04 with:

04-19-19

78-4.04 STAINING CONCRETE AND SHOTCRETE

78-4.04A General

78-4.04A(1) Summary

Section 78-4.04 includes specifications for preparing and staining concrete and shotcrete surfaces.

78-4.04A(2) Definitions

acid stain: non-tintable, transparent stain that contains dilute acid.

water-based stain: semi-transparent or solid water-based coating in an acrylic emulsion vehicle, that can be tinted to match an AMS-STD-595 color.

78-4.04A(3) Submittals

78-4.04A(3)(a) General

Submit the stain and sealer manufacturer's product data and application instructions at least 7 days before starting staining activities.

78-4.04A(3)(b) Contractor Qualifications

Submit the following documentation at least 10 days before the prestaining meeting:

1. Summary of the staining contractor's experience that demonstrates compliance with section 78-4.04A(4)(c).
2. List of at least 3 projects completed in the last 5 years that demonstrate the staining contractor's ability to stain surfaces similar to the surfaces for this project. For each project include:
 - 2.1. Project description
 - 2.2. Name and phone number of the owner
 - 2.3. Staining completion date
 - 2.4. Color photos of the completed stained surface

78-4.04A(3)(c) Staining Quality Work Plan

Submit a staining quality work plan at least 10 days before the prestaining meeting. The work plan must include details for preparing and staining the surfaces to achieve the required color, and for sealing the surfaces, including:

1. Number of applications that will be used to apply the stain
2. For each application of the stain, a description of:
 - 2.1. Manufacturer, color, finish, and percentage strength mixture of the stain that will be applied
 - 2.2. Proposed methods and tools for applying the stain
3. Proposed methods for protecting adjacent surfaces during staining
4. Proposed methods and tools for applying the sealer

For acid stains, the work plan must also include a rinse water collection plan for containing all liquid, effluent, and residue resulting from preparing and staining the surfaces.

78-4.04A(4) Quality Assurance

78-4.04A(4)(a) General

Reserved

78-4.04A(4)(b) Test Panels

Stain the authorized test panel complying with section 51-1.01D(2)(c) or section 53-3.01D(3).

The test panel must be:

1. Stained using the same personnel, materials, equipment, and methods to be used in the work
2. Accessible for viewing
3. Displayed in an upright position near the work
4. Authorized for staining before starting the staining work

If ordered, construct additional test panels until a satisfactory color is attained. The preparing and staining of additional test panels is change order work.

The Engineer uses the authorized stained test panel to determine the acceptability of the stained surface.

Dispose of the test panels after the staining work is complete and authorized. Notify the Engineer before disposing of the test panels.

78-4.04A(4)(c) Contractor Qualifications

The staining contractor must have experience staining surfaces to simulate the appearance of natural rock formations or stone masonry, and must have completed at least 3 projects in the past 5 years involving staining of surfaces similar to the surfaces for this project.

78-4.04A(4)(d) Prestaining Meeting

Before starting staining activities, conduct a meeting to discuss the staining quality work plan. Meeting attendees must include the Engineer and all staining contractors.

78-4.04B Materials

78-4.04B(1) General

Reserved

78-4.04B(2) Stain

78-4.04B(2)(a) General

The stain must be:

1. Commercially available product designed specifically for exterior applications
2. Specifically manufactured for staining concrete surfaces

78-4.04B(2)(b) Acid Stain

Acid stain must:

1. Contain dilute acid that penetrates and etches the surfaces
2. Be a water-based solution of inorganic metallic salts
3. Produce abrasion-resistant color deposits

78-4.04B(2)(c) Water-based Stain

Water-based stain must be:

1. Acrylic emulsion
2. Non-fading and UV resistant
3. Capable of producing irregular, mottled tones

78-4.04B(3) Sealer

The sealer must be as recommended by the stain manufacturer, clear and colorless, and have a matte finish when dry.

78-4.04B(4) Joint Sealing Compound

Reserved

78-4.04C Construction

78-4.04C(1) General

At locations where there is exposed metal adjacent to the surfaces to be stained, seal the joint between the surfaces to be stained and the exposed metal with a joint sealing compound before applying the stain.

78-4.04C(2) Surface Preparation

Test surfaces for acceptance of the stain before applying the stain. Clean surfaces that resist accepting the stain and retest until passing.

Before staining, the surfaces must be:

1. At least 28 days old
2. Prepared under SSPC-SP 13/NACE no. 6
3. Thoroughly dry

78-4.04C(3) Application

78-4.04C(3)(a) General

Apply the stain under the manufacturer's instructions. Protect adjacent surfaces during staining. Drips, puddles, or other irregularities must be worked into the surface.

Apply the sealer under the manufacturer's instructions.

78-4.04C(3)(b) Acid Stain

Work the acid stain into the concrete using a nylon bristle brush in a circular motion.

After the last coat of stain has dried, rinse the stained surfaces with water and wet scrub them with a stiff-bristle nylon brush until the rinse water runs clear. Collect all rinse water.

78-4.04D Payment

Not Used

Replace section 78-23 with:

04-17-20

78-23 ADJUST UTILITY FRAMES, COVERS, AND MANHOLES

78-23.01 GENERAL

Section 78-23 includes specifications for adjusting utility access box frames, covers, and manholes.

Work performed on existing utility frames, covers, grates and manholes must comply with section 15.

78-23.02 MATERIALS

Not Used

78-23.03 CONSTRUCTION

Lower and raise utility frames, covers, grates and manholes by lowering before cold planing and raising after paving or surfacing. Before opening the lane to traffic, either (1) complete permanent paving or surfacing or (2) temporarily fill any depressions with HMA.

Do not adjust to final grade until the adjacent pavement or surfacing is complete.

For a structure that is to be raised, remove the cover or frame and trim the top of the structure to provide a suitable foundation for the new material.

Instead of using new materials similar in character to those in the existing structure, you may use raising devices to adjust a manhole to grade. Before starting paving work, measure and fabricate raising devices. Raising devices must:

1. Comply with the specifications for section 75 except that galvanizing is not required
2. Have a shape and size that matches the existing frame
3. Be match marked by painting identification numbers on the device and corresponding structure
4. Result in an installation that is equal to or better than the existing one in stability, support, and nonrocking characteristics
5. Be fastened securely to the existing frame without projections above the surface of the road or into the clear opening

Where manholes are to be lowered, remove the top portion to 3.5 feet below finished grade or to an authorized depth. Adjust the manhole using the taper needed to match the finished grade.

If a manhole cover is unstable or noisy under traffic, place a coil of asphalt-saturated rope, a plastic washer, or asphaltic compound on the cover seat. Before placement, obtain authorization for use of the material.

AA

DIVISION IX TRAFFIC CONTROL DEVICES
82 SIGNS AND MARKERS

04-16-21

Replace the list in the 1st paragraph of section 82-2.01C with:

04-19-19

- 1. Aluminum sheeting
- 2. Retroreflective sheeting
- 3. Color imaging methods and film
- 4. Protective-overlay film

Replace section 82-2.02C with:

04-17-20

82-2.02C Retroreflective Sheeting

Retroreflective sheeting used for the background and legend must comply with ASTM D4956-13 and must be on the Authorized Material List for signing and delineation materials.

Retroreflective sheeting must be Type XI, except for white background signs, it must be Type VIII or IX.

Warning sign plaques and panels must be retroreflective fluorescent orange or fluorescent yellow background.

Type VIII, IX, and XI retroreflective sheeting must have Class 1, 3, or 4 adhesive backing. Adhesive backing must be pressure sensitive and fungus resistant.

Retroreflective sheeting must be applied to sign panels at the fabrication plant under the retroreflective sheeting manufacturer's instructions without appreciable stretching, tearing, or other damage.

Orientation of the legend must comply with the retroreflective sheeting manufacturer's instructions.

Retroreflective sheeting on a sign panel with a minor dimension of 48 inches or less must be a single, contiguous sheet without splices except for the splices produced during the manufacture of the retroreflective sheeting. Sign panel with a minor dimension greater than 48 inches may have 1 horizontal splice in the retroreflective sheeting other than the splices produced during the manufacture of the retroreflective sheeting.

Unless the retroreflective sheeting manufacturer's instructions require a different method, splices in the retroreflective sheeting must overlap by at least 1 inch. The retroreflective sheeting on either side of a splice must not exhibit a color difference under incident and reflected light.

Replace section 82-2.02D with:

04-19-19

82-2.02D Color Imaging Methods and Film

The material used for color imaging methods, film, and protective-overlay must be recommended by the retroreflective sheeting manufacturer.

Colored retroreflective sheeting must be used for the background.

Signs with green, red, blue, or brown backgrounds may use reverse-screened-process color on white retroreflective sheeting for the background color. The coefficient of retroreflection must be at least 70 percent of the coefficient of retroreflection specified in ASTM D4956 for the corresponding color of retroreflective sheeting.

The sign must have outdoor weatherability characteristics equivalent to those specified for the corresponding color of retroreflective sheeting in ASTM D4956.

Replace the 2nd paragraph of section 82-3.01A with:

04-17-20

Roadside signs include ground-mounted signs and Type N (CA), Type P (CA), and Type R (CA) marker panels.

Add to section 82-3.01B:

04-17-20

ground-mounted sign: Roadside sign or signs with a wide-flange metal post.

Replace section 82-3.01D with:

10-16-20

82-3.01D Quality Assurance

When delivered to the job site, treated posts must:

1. Comply with the specified grading requirements
2. Be dry
3. Have no visual evidence of preservative on the surface

Add to section 82-3.02B:

04-16-21

Wide-flange metal posts must be fabricated from structural steel complying with ASTM A36/A36M. Nuts, bolts, and washers for the breakaway connections of a wide-flange steel post must comply with ASTM A325.

Perforated square steel tube posts and square steel anchor sleeves must:

1. Be fabricated from galvanized hot rolled steel complying with ASTM 1011 Grade 50 and galvanized under ASTM 653 G-90.
2. Have a minimum 60 ksi yield strength after cold forming.
3. Have zinc coated corner welds. Corner welds must be scarfed and then a conversion coating and clear organic polymer topcoat must be applied.

Perforated square steel tube post must have 7/16-inch diameter holes or punch-outs 1-inch on center on all four sides.

Gravel or stone for a steel tube post foundation must be natural rough surface gravel or broken stone.

Concrete for a steel tube post foundation must be minor concrete that contains at least 470 pounds of cementitious material per cubic yard.

10-16-20

Delete the 3rd paragraph of section 82-3.02C.

Replace the 4th paragraph of section 82-3.02C with:

10-16-20

Posts must be treated under section 57-2.01B(3) and under AWPA U1, Use Category UC4A, Commodity Specification A. Posts must be incised, and the minimum retention of preservative must comply with AWPA requirements.

Add to section 82-3.02E:

04-16-21

Sign panel drive rivets must be galvanized steel or aluminum.

Square steel tube post drive rivets must be galvanized steel.

Replace the 9th paragraph of section 82-3.03A with:

04-16-21

Backfill the space around the wide-flange metal posts with minor concrete that contains at least 470 pounds of cementitious material per cubic yard.

Add to section 82-3.03A:

04-16-21

Fasten square steel tube posts to square steel anchor sleeves with square steel tube post drive rivets.

Add to section 82-3.03B:

04-16-21

Attach sign panel to square steel tube post with sign panel drive rivets. Place a fiber washer between the rivet head and the sign face.

Replace section 82-5.01A with:

10-19-18

Section 82-5 includes specifications for fabricating and installing markers, including milepost markers.

Replace the 2nd paragraph in section 82-5.02E with:

10-19-18

A target plate for milepost marker or Type L-1 (CA) or Type L-2 (CA) object marker installed on a metal post must be manufactured from an aluminum sheet or zinc-coated steel sheet.

Replace section 82-5.02H with:

10-19-18

82-5.02H Milepost Markers

Letters and numerals on a milepost marker must be made with opaque black paint or film. The paint and film must have an equivalent outdoor weatherability as the retroreflective sheeting specified in ASTM D4956. Nonreflective, opaque, black film must be vinyl or acrylic material.

Film for letters and numerals must be computer cut and have pressure-sensitive adhesive.

Replace the 5th paragraph of section 82-5.03 with:

10-19-18

Use stencils to paint letters and numerals on milepost markers.

You may field bore the 2-3/8-inch-diameter holes shown for wood guardrail terminal posts and wood rail tensioning assembly posts.

If you perform field cutting or boring after treatment, manually treat with preservative under section 57-2.01C(3)(b).

Replace the 4th paragraph of section 83-2.03C with:

04-19-19

If median barrier delineation is shown, match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

Replace the 3rd paragraph of section 83-2.05B(3) with:

10-16-20

Stud bolts must comply with the specifications for studs in clause 9 of AWS D1.1.

Add to section 83-2.05B(3):

04-15-22

Anchor bolts for ST-75 railing must comply with ASTM F1554, Grade 105.

Replace section 83-2.08 with:

04-16-21

83-2.08 TUBULAR RAILINGS

83-2.08A General

83-2.08A(1) Summary

Section 83-2.08 includes specifications for constructing tubular railings.

Tubular railing includes rail tubes, post tubes, plates, rail splice sleeves, and fasteners.

Paint for galvanized railing must comply with section 59-3.

83-2.08A(2) Definitions

Reserved

83-2.08A(3) Submittals

Submit a certificate of compliance verifying that all components of the tubular railing comply with section 83-2.08B.

Submit shop drawings for tubular railing. Shop drawings must include:

1. Details for venting holes in rails, posts, and sleeves
2. Railing layout
3. Complete details for the construction of the work including methods of construction, sequence of shop and field assembly, galvanization, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.08A(4) Quality Assurance

Reserved

83-2.08B Materials

The materials for tubular railing components must comply with the specifications shown in the following table:

Material	Specification
Rail and post tubes	ASTM A500/A500M, Grade B
Rolled bars and plates	ASTM A36/A36M
Rail splice sleeves	ASTM A36/A36M
Bolts	ASTM F3125, Grade A325/A325M, Type 1
Threaded rods	ASTM A449, Type 1
Nuts for bolts and threaded rods	ASTM A563/A563M
Washers for bolts and threaded rods	ASTM F436/F436M

Bolts and threaded rods furnished under ASTM A449 must comply with the mechanical requirements specified in ASTM A449 after galvanizing.

Rail tubes must be shop bent or fabricated to fit the horizontal curve if the radius is less than 900 feet.

If the vertical radius of the tubular handrailing is 30 feet or less, that portion of the railing must be either shop bent or built up from 1/4-inch-thick structural steel plates. The built-up tubular rail elements must match the seamless tubing in appearance.

The difference between out-to-out rail splice sleeve dimensions and the clear inside dimensions of the tubular steel rail elements must not exceed 3/16 inch after galvanizing.

Carefully handle the materials such that no parts are bent, broken, abraded, or otherwise damaged. Do not use manufacturing, handling, or installation methods that damage or distort the members or damage the galvanizing.

83-2.08C Construction

83-2.08C(1) General

Before the tubular railing parts are assembled, clean the bearing surfaces and surfaces to be in permanent contact. If the railing is mounted on a concrete surface, the post bases must be true and flat to provide uniform bearing.

Tubular railings must present a smooth, uniform appearance in their final position and conform closely to the horizontal and vertical lines as shown.

83-2.08C(2) Tubular Handrailing

Adjust the vertical position of the tubular handrailing to compensate for the camber and dead load deflection of the superstructure. The Engineer determines the adjustment amount before the railing is installed.

The metal railing posts to which the chain link railing attaches must fit the mounting brackets, pipe sleeves, and other connection fittings.

Where necessary, install shims at posts and rail elements to provide uniform bearing and conformance with the horizontal lines and vertical grade lines. Shims at steel posts must be commercial-quality, galvanized sheet steel.

83-2.08C(3) Tubular Bicycle Railing

When mounted on concrete barriers, cast sleeves for threaded rods in concrete. If authorized, you may drill and bond the threaded rods using chemical adhesive systems under section 51-1.

Erect railing true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

83-2.08D Payment

Not Used

Delete the 7th paragraph of section 83-3.01A.

10-15-21

Replace section 83-3.02F with:

83-3.02F Reserved

10-15-21

Replace section 83-3.03A(7) with:

83-3.03A(7) Finishing

04-15-22

Before applying the curing compound, the surface finish of Type 60 series concrete barriers must be free from surface pits larger than 1 inch in diameter, and you must give the surface a soft brush finish with strokes parallel to the line of the barriers. Do not finish the surface with a brush application of grout.

To facilitate finishing, remove fixed forms for CIP Type 60 series concrete barriers as soon as possible after the concrete has set enough to maintain the barrier shape without support.

The surface finish of Type 60 series concrete barriers must be Class 1 surface finish if cured by the forms-in-place method.

At least 7 days after placing Type 60 series concrete barriers, give the exposed surfaces a final light abrasive blast finish to achieve a uniform appearance.

The final surface finish of concrete barriers other than Type 60 series must be a Class 1 surface finish. Any alternative method of final surface finishing must be authorized.

Class 1 surface finish must comply with section 51-1.03F(3).

Replace section 83-3.03A(8) with:

83-3.03A(8) Curing

04-15-22

Cure the exposed surfaces of concrete barriers by the curing compound method using curing compound no. 6.

For concrete barriers on bridges and walls that do not support soundwalls, you may cure the formed surfaces of the barriers by keeping the forms in place for at least 12 hours after placing the concrete. No further curing is required after the forms are removed.

For Type 60 series concrete barriers not using the forms-in-place curing method, apply the curing compound using a mechanical sprayer capable of applying the curing compound to at least one entire side and the top of the concrete barrier in one application at a uniform rate of coverage. Protect the spray against wind.

In freeze-thaw areas, cure concrete barriers on bridges and walls by the water method.

For Type 80 and Type 85 series concrete barriers, cure the formed surfaces of the barriers by keeping the forms in place for at least 36 hours after placing the concrete. No further curing is required after the forms are removed.

Replace the paragraph of section 83-3.03A(11) with:

04-19-19

Where concrete barrier markers are shown, cement the markers to the barrier under the manufacturer's instructions. Match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

Submit test results for each lot of beads specifying the EPA test methods used and tracing the lot to the specific test sample. The testing for lead and arsenic content must be performed by an independent testing laboratory.

Submit the thermoplastic test stripe to the Engineer.

Submit the retroreflectivity test result within 5 days of testing the traffic stripes and pavement markings. The data must include the retroreflectivity, time, date, and GPS coordinates for each measurement.

84-2.01D Quality Assurance

84-2.01D(1) General

Reserved

84-2.01D(2) Quality Control

Before starting permanent application of methyl methacrylate and two component paint traffic stripes and pavement markings, apply a test stripe on roofing felt or other suitable material in the presence of the Engineer. The test stripe section must be at least 50 feet in length.

Upon request, apply a thermoplastic test stripe on suitable material in the presence of the Engineer during the application of thermoplastic traffic stripes or markings. The test stripe must be at least 1 foot in length.

Remove loose glass beads before measuring the retroreflectivity. Obtain authorization to proceed with the application of traffic stripes and pavement markings.

Within 30 days of application, test the traffic stripes and pavement markings under the test methods and frequencies shown in the following table:

Traffic Stripe Testing Frequency

Quality characteristic	Test method	Minimum sampling and testing frequency
Initial retroreflectivity (min, $\text{mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$) White Yellow	ASTM E1710	ASTM D7585 ^a

^aUse the referee evaluation protocol for project length less than 10 miles. For project lengths greater than or equal to 10 miles, add one evaluation for every additional mile.

Verify the glass bead application rate by stabbing the glass bead tank with a calibrated rod.

84-2.01D(3) Department Acceptance

The Engineer will perform a nighttime, drive-through, visual inspection of the retroreflectivity of the traffic stripes and pavement markings and notify you of any locations with deficient retroreflectivity. Test the retroreflectivity of the deficient areas to confirm striping and pavement markings meets the requirements.

The thermoplastic test stripe will be tested for yellow color, daytime luminance factor, and yellowness index requirements by METS.

84-2.02 MATERIALS

84-2.02A General

Reserved

84-2.02B Glass Beads

Each lot of glass beads must comply with EPA Test Method 3052 and 6010B or 6010C. Glass beads must contain less than 200 ppm each of arsenic and lead.

Type 1 glass beads must comply with AASHTO M 247.

Type 2 glass beads must comply with AASHTO M 247. At least 75 percent of the beads by count must be true spheres that are colorless and do not exhibit dark spots, air inclusions, or surface scratches when viewed under 20X magnification.

High-performance glass beads must be on the Authorized Material List for high-performance glass beads.

Large-gradation glass beads must be on the Authorized Material List for two component traffic paint.

Glass beads for methyl methacrylate must be on the Authorized Material List for methyl methacrylate traffic striping and pavement marking.

Glass beads for paint must comply with State Specification 8010-004.

Glass beads must be surface treated, according to the bead and the material manufacturer's instructions, to promote adhesion with the specified material.

84-2.02C Thermoplastic

Thermoplastic must comply with State Specification PTH-02HYDRO, or PTH-02ALKYD.

Sprayable thermoplastic must comply with State Specification PTH-02SPRAY.

Each lot or batch of thermoplastic must be tested under California Test 423.

84-2.02D Methyl Methacrylate

Methyl methacrylate traffic paint must:

1. Be on the Authorized Material List for methyl methacrylate traffic striping and pavement marking
2. Be Category 2

84-2.02E Traffic Striping and Pavement Marking Tape

Traffic striping and pavement marking tape must be on the Authorized Material List for signing and delineation materials.

04-19-19

White tape must have an initial retroreflectivity of a minimum 700 mcd/m².

Yellow tape must have an initial retroreflectivity of a minimum 500 mcd/m².

10-19-18

When contrast is required for traffic striping and pavement marking tape, the tape must be pre-formed and retroreflective, consisting of a white film with retroreflective beads and a contrasting black film border. The contrasting black border must be a nonreflective film bonded on each side of the white film to form a continuous roll. Each black border must be a minimum of 2 inches wide. The width of the tape must be at least 4 inches wider than the stripe width.

84-2.02F Two-Component Paint

Two-component traffic paint must be on the Authorized Material List for two component traffic paint.

04-15-22

84-2.02G Paint

Paint must comply with the requirements shown in following table:

Paint Specifications		
Paint type	Color	Specification
Waterborne traffic line	White, yellow, and black	State Specification PTWB-01R2
Waterborne traffic line for the international symbol of accessibility and other curb markings	Blue, red, and green	Federal Specification TT-P-1952F

84-2.02H–84-2.02L Reserved

84-2.03 CONSTRUCTION

84-2.03A General

Establish the alignment for traffic stripes and the layouts for pavement markings with a device or method that will not conflict with other traffic control devices.

Protect existing retroreflective pavement markers during work activities.

Remove existing pavement markers that are coated or damaged by work activities and replace with an equivalent marker on the Authorized Material List for signing and delineation materials.

A completed traffic stripe or pavement marking must:

1. Have well defined edges
2. Be uniform
3. Be free from runs, bubbles, craters, drag marks, stretch marks, and debris

A completed traffic stripe must:

1. Be straight on a tangent alignment
2. Be a true arc on a curved alignment
3. Not deviate from the width shown by more than:
 - 3.1. 1/4 inch on a tangent alignment
 - 3.2. 1/2 inch on a curved alignment

The length of the gaps and individual stripes that form a broken traffic stripe must not deviate by more than 2 inches from the lengths shown. The gaps and stripes must be uniform throughout the entire length of the traffic stripe.

Protect newly placed traffic stripes and pavement markings from traffic and work activities until the traffic stripes and pavement markings are dry or hard enough to bear traffic.

Use mechanical methods to remove dirt, contaminants, and loose material from the pavement surface before applying the traffic stripe or pavement marking.

Use abrasive blast cleaning to remove laitance and curing compound from the surface of new concrete pavement before applying the traffic stripe or pavement marking.

Construct recesses as shown in the following table:

Material	Requirement	
	Depth (mils)	Depth (in)
Thermoplastic	375	3/8
Two component traffic paint	250	1/4
Methyl methacrylate traffic paint	250	1/4

Construct recesses for double traffic stripes in a single pass.

Before applying the traffic stripes and pavement markings:

1. Allow wet ground recesses to dry a minimum of 24 hours
2. Remove all powdery residue from dry recess
3. Keep the recesses dry and free from debris

Apply traffic stripes and pavement markings before the end of the same work shift.

84-2.03B Application of Traffic Stripes and Pavement Markings

84-2.03B(1) General

Apply material for a pavement marking with a stencil or a preformed marking.

Immediately remove drips, overspray, improper markings, or material tracked by traffic, using an authorized method.

Apply a traffic stripe or a pavement marking only to a clean, dry surface during a period when the pavement surface temperature is above 50 degrees F.

Apply traffic stripe or pavement marking and glass beads in a single pass. You may apply the glass beads by hand on pavement markings.

Embed glass beads to a depth of 1/2 their diameters.

Distribute glass beads uniformly on traffic stripe and pavement markings.

Glass beads with integral color must match the color of the stripe or pavement marking.

Apply glass beads with two separate applicator guns when two gradations are specified.

Allow enough overlap distance between new and existing striping patterns to ensure continuity at the start and end of the transition.

The retroreflectivity of applied traffic stripes and pavement markings must comply with the requirements shown in the following table:

Retroreflectivity Requirements

Traffic stripe material	White (min, $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$)	Yellow (min, $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$)
Paint	250	125
Thermoplastic	250	125
Thermoplastic with wet night enhanced visibility	700	500
Two component	250	125
Methyl methacrylate	500	300
Tape	700	500

84-2.03B(2) Thermoplastic

84-2.03B(2)(a) General

Apply primer or surface preparation adhesive under the manufacturer's instructions:

1. To all roadway surfaces except for asphaltic surfaces less than 6 months old
2. At a minimum rate of 1 gallon per 300 square feet
3. To allow time for the thermoplastic primer to dry and become tacky before application of the thermoplastic

Do not thin the primer.

Preheat thermoplastic using preheaters with mixers having a 360-degree rotation.

Apply thermoplastic in a single uniform layer by spray or extrusion methods.

Completely coat and fill voids in the pavement surface with the thermoplastic.

Apply recessed thermoplastic at a thickness so that the top is 0 to 1/16 inch below the pavement surface.

84-2.03B(2)(b) Extruded Thermoplastic

Apply extruded thermoplastic at a temperature of 400 to 425 degrees F or as recommended by the manufacturer.

Apply extruded thermoplastic for a traffic stripe at a rate of at least 0.36 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied traffic stripe must be at least 0.060 inch thick.

Apply extruded thermoplastic pavement markings at a thickness from 0.100 to 0.150 inch.

Apply Type 2 glass beads to the surface of the molten thermoplastic at a rate of at least 8 lb of beads per 100 sq ft.

84-2.03B(2)(c) Sprayable Thermoplastic

Apply sprayable thermoplastic at a temperature of 350 to 400 degrees F.

Apply sprayable thermoplastic for a traffic stripe at a rate of at least 0.24 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied stripe must be at least 0.040 inch thick.

84-2.03B(2)(d) Thermoplastic with Enhanced Wet-Night Visibility

Apply a thermoplastic traffic stripe or pavement marking with enhanced wet-night visibility in a single pass and in the following order:

1. Uniform layer of extruded thermoplastic
2. Layer of high-performance glass beads
3. Layer of Type 2 glass beads

Apply thermoplastic with enhanced wet-night visibility at a maximum speed of 8 mph.

Apply thermoplastic with enhanced wet-night visibility for a traffic stripe at a rate of at least 0.47 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied stripe must be at least 0.090 inch thick.

Apply thermoplastic with enhanced wet-night visibility for a pavement marking at a rate of at least 1.06 lb of thermoplastic per square foot of marking. The applied pavement marking must be at least 0.100 inch thick.

Apply high-performance glass beads at a rate of at least 6 lb of glass beads per 100 sq ft of stripe or marking. Apply Type 2, glass beads at a rate of at least 8 lb of glass beads per 100 sq ft of stripe or marking.

84-2.03B(3) Methyl Methacrylate

Apply the methyl methacrylate when the pavement surface and atmospheric temperatures are from 40 to 104 degrees F.

Apply methyl methacrylate paint at a minimum thickness of 0.090 inch.

Apply recessed methyl methacrylate paint at a minimum thickness of 0.200 inch.

Apply the glass beads recommended by the methyl methacrylate manufacturer.

84-2.03B(4) Traffic Striping and Pavement Marking Tape

Do not use traffic stripe and pavement marking tape on existing open graded friction course or chip seal.

Prepare pavement surface and use primer under the traffic tape manufacturer's written instructions. Apply tape to clean and dry pavement surface. Roll or tamp the traffic tape in place.

84-2.03B(5) Two-Component Paint

Apply a two-component painted traffic stripe or pavement marking in a single pass and in the following order:

1. Coat of two-component paint
2. Application of large gradation glass beads recommended by the two-component paint manufacturer
3. Application of Type 1 glass beads

Apply two-component paint when the pavement surface temperature is above 39 degrees F and the atmospheric temperature is above 36 degrees F. The temperature of the paint must comply with the paint manufacturer's instructions.

Apply two-component paint and glass beads at a maximum speed of 10 mph.

Apply large-gradation glass beads at a minimum rate of 11.7 lb of beads per gallon of paint.

Apply Type 1 glass beads at a minimum rate of 8.3 lb of beads per gallon of paint.

Apply two-component paint for the traffic stripes and pavement markings at the thickness and application rates shown in the following table:

Type of pavement	Stripe thickness (min, inch)	Application rate (min, sq ft/gal)
HMA open graded/chip seal	0.025	64
HMA dense graded	0.020	80
Concrete	0.020	80

Apply recessed two-component paint at a thickness between 0.020 and 0.025 inch.

84-2.03B(6) Paint

Do not apply paint if:

1. Fresh paint could become damaged by rain, fog, or condensation
2. Atmospheric temperature could drop below 50 degrees F during the drying period

Do not thin paint.

Use mechanical means to paint traffic stripes and pavement markings and to apply glass beads for traffic stripes.

The striping machine must be capable of superimposing successive coats of paint on the 1st coat and on existing stripes at a minimum speed of 5 mph.

Where the configuration or location of a traffic stripe is such that the use of a striping machine is not practicable, you may apply the traffic paint and glass beads by other methods and equipment if authorized.

Apply traffic stripes and pavement markings in 1 coat on existing pavement surfaces, at an approximate rate of 107 sq ft/gal.

Apply traffic stripes and pavement markings in 2 coats on a new pavement surface. The 1st coat of paint must be dry before applying the 2nd coat.

Apply 2-coat paint at the approximate rate of 215 sq ft/gal for each coat.

Paint a 1-coat, 3-inch-wide black stripe between the two 6-inch-wide yellow stripes of a double traffic stripe. If the two 6-inch-wide yellow stripes are applied in 2 coats, apply the black stripe concurrently with the 2nd coat of the yellow stripes.

On 2-lane highways:

1. If the 1st coat of the centerline stripe is applied in the same direction as increasing post miles, use the right-hand spray gun of the 3 spray guns to apply a single yellow stripe
2. If the 1st coat of the centerline stripe is applied in the same direction as decreasing post miles, use the left-hand spray gun of the 3 spray guns to apply a single yellow stripe
3. Apply the 2nd coat of centerline striping in the opposite direction of the 1st coat

Apply glass beads at an approximate rate of 5 lb of beads per gallon of paint.

Verify the application rate of paint by stabbing the paint tank with a calibrated rod. If the striping machine has paint gauges, the Engineer may measure the volume of paint using the gauges instead of stabbing the paint tank with a calibrated rod.

84-2.03B(7) Contrast Striping

04-19-19

Contrast striping consists of black striping placed on each side of a white stripe.

10-19-18

You may use permanent tape instead of paint or thermoplastic.

Apply contrast stripe paint in one coat.

Do not use glass beads or other reflective elements in contrast striping material.

04-19-19

84-2.03B(8)–84-2.03B(10) Reserved

10-19-18

84-2.04 PAYMENT

The payment quantity for a traffic stripe is the length measured along the line of the traffic stripe without deductions for gaps in the broken traffic stripe.

The payment quantity for a pavement marking is the area covered.

A double traffic stripe consisting of two 6-inch-wide yellow stripes are measured as 2 traffic stripes except for painted traffic stripes and sprayable thermoplastic traffic stripes. A double sprayable thermoplastic traffic stripe consisting of two 6-inch-wide yellow stripes are measured as single traffic stripe.

A double painted traffic stripe consisting of two 6-inch-wide yellow stripes separated by a 3-inch-wide black stripe is measured as a single traffic stripe.

The payment quantity for contrast striping is the length measured along the line of the traffic stripe without deductions for gaps in the broken traffic stripe.

Replace section 84-9 with:

10-19-18

84-9 EXISTING MARKINGS

84-9.01 GENERAL

84-9.01A Summary

Section 84-9 includes specifications for removing existing markings.

Work performed on existing markings must comply with section 15.

84-9.01B Definitions

Reserved

04-19-19

84-9.01C Submittals

10-19-18

Submit your proposed method for removing traffic stripes and pavement markings at least 7 days before starting the removal work. Allow 2 business days for the review.

84-9.02 MATERIALS

Not Used

84-9.03 CONSTRUCTION

84-9.03A General

Remove existing traffic stripes before making any changes to the traffic pattern.

Remove existing traffic stripes and pavement markings before applying the following materials:

1. Traffic stripe and pavement marking tape
2. Two component traffic stripes and pavement markings
3. Methyl methacrylate traffic stripes and pavement markings

04-19-19

Remove contrast stripes, traffic stripes and pavement markings, including any paint in the gaps, by methods that do not remove pavement to a depth of more than 1/8 inch.

10-19-18

Remove pavement markings such that the old message cannot be identified. Make any area removed by grinding rectangular. Water must not puddle in the ground areas. Fog seal ground areas on asphalt concrete pavement.

Sweep up or vacuum any residue before it can (1) be blown by traffic or wind, (2) migrate across lanes or shoulders, or (3) enter a drainage facility.

84-9.03B Remove Traffic Stripes and Pavement Markings Containing Lead

Reserved

84-9.03C–84-9.03J Reserved

84-9.04 PAYMENT

The payment quantity for remove traffic stripe is the measured length multiplied by:

1. 0.67 for a single 4-inch-wide traffic stripe
2. 1.34 for a single 8-inch-wide traffic stripe
3. 2 for a double traffic stripe

The payment quantity for remove traffic stripe does not include the gaps in broken traffic stripes. Payment for removal of paint evident in a gap is included in the payment for remove traffic stripe of the type involved.

If no bid item is shown on the Bid Item List for remove pavement marking, remove pavement marking is paid for as remove traffic stripe of the types shown in the Bid Item List and the payment quantity for 1 square foot of pavement marking is 2 linear feet.

10-18-19

AA

DIVISION X ELECTRICAL WORK

86 GENERAL

04-15-22

Replace section 86-1.01B with:

10-19-18

86-1.01B Definitions

accessible pedestrian signal: Accessible pedestrian signal as defined in the *California MUTCD*.

accessible walk indication: Activated audible and vibrotactile action during the walk interval.

actuation: Actuation as defined in the *California MUTCD*.

ambient sound level: Background sound level in dB at a given location.

ambient sound sensing microphone: Microphone that measures the ambient sound level in dB and automatically adjusts the accessible pedestrian signal speaker's volume.

audible speech walk message: Audible prerecorded message that communicates to pedestrians which street has the walk interval.

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. Department of Energy program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

controller assembly: Assembly for controlling a system's operations, consisting of a controller unit and auxiliary equipment housed in a waterproof cabinet.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

detector: Detector as defined in the *California MUTCD*.

electrolier: Assembly of a lighting standard and luminaire.

flasher: Device for opening and closing signal circuits at a repetitive rate.

illuminance gradient: Ratio of the minimum illuminance on a 1-foot square of sign panel to that on an adjacent 1-foot square of sign panel.

inductive loop detector: Detector capable of being actuated by an inductance change caused by a vehicle passing or standing over the loop. An inductive loop detector includes a loop or group of loops installed in the roadway and a lead-in cable installed and connected inside a controller cabinet.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from the initial values.

lighting standard: Pole and mast arm supporting the luminaire.

link: Part of a system which provides a data connection between a transmitter and receiver.

LM-79: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing and estimating the long-term performance of LEDs for general lighting purposes.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

mid-span access method: Procedure in which fibers from a single buffer tube are accessed and spliced to a multi buffer tube cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

National Voluntary Laboratory Accreditation Program: U.S. Department of Energy program that accredits independent testing laboratories.

optical time domain reflectometer: Fiber optic test equipment 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 or defects in the fiber.

pedestrian change interval: Pedestrian change interval as defined in the *California MUTCD*.

powder coating: Coating applied electrostatically using exterior-grade, UV-stable, polymer powder.

power factor: Ratio of the real power component to the complex power component.

power meter: Portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. Its display indicates the amount of power injected by the light source at the designed wavelength of the system under testing that arrives at the receiving end of the link.

pretimed controller assembly: Assembly operating traffic signals under a predetermined cycle length.

programming mechanism: Device to program the accessible pedestrian signal operation.

pull box: Box with a cover that is installed in an accessible place in a conduit run to facilitate the pulling in of wires or cables.

push button information message: Push button information message as defined in the *California MUTCD*.

push button locator tone: Push button locator tone as defined in the *California MUTCD*.

segment: Continuous cable terminated by 2 splices, 2 connectors or 1 splice and 1 connector.

signal face: Signal face as defined in the *California MUTCD*.

signal head: Signal head as defined in the *California MUTCD*.

signal indication: Signal indication as defined in the *California MUTCD*.

signal section: Signal section as defined in the *California MUTCD*.

signal standard: Pole with or without mast arms carrying 1 or more signal faces.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway, such as traveled ways and freeway lanes.

surge protection device: Subsystem or component that protects equipment against short-duration voltage transients in power line.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

traffic-actuated controller assembly: Assembly for operating traffic signals under the varying demands of traffic as registered by detector actuation.

traffic phase: Traffic phase as defined in the *California MUTCD*.

vehicle: Vehicle as defined in the *California Vehicle Code*.

vibrotactile pedestrian device: Vibrotactile pedestrian device as defined in the *California MUTCD*.

10-19-18

Delete the 9th and 10th paragraphs of section 86-1.01C(1).

Replace section 86-1.01C(3) with:

10-19-18

86-1.01C(3) Luminaires

Submit for a luminaire:

1. Maximum power in watts
2. Maximum designed junction temperature
3. Heat sink area in square inches
4. Designed junction-to-ambient thermal resistance calculation with thermal resistance components clearly defined
5. L70 in hours when extrapolated for the average nighttime operating temperature
6. Life expectancy based on the junction temperature
7. Manufacturer's data sheet for the power supply, including the rated life

Submit the manufacturer's QC test data for luminaires as an informational submittal.

Replace section 86-1.01C(4) with:

10-19-18

86-1.01C(4) Reserved

Replace section 86-1.02B with:

04-15-22

86-1.02B Conduit and Accessories

86-1.02B(1) General

Conduit and fittings must comply with the requirements shown in the following table:

Conduit and Fitting Requirements

Type	Requirement
1	Must be hot-dip galvanized rigid steel complying with UL 6 and ANSI C80.1. The zinc coating must comply with copper sulfate test requirements in UL 6. Fittings must be electrogalvanized and certified under UL 514B.
2	Must comply with requirements for Type 1 conduit and be coated with PVC or polyethylene. The exterior thermoplastic coating must have a minimum thickness of 35 mils. The internal coating must have a minimum thickness of 2 mils. Coated conduit must comply with NEMA RN 1, or NRTL PVC-001.
3	Must be Type A, extruded, rigid PVC conduit complying with UL 651 or must be HDPE conduit complying with UL 651A.
4	Must have an inner, flexible metal core covered by a waterproof, nonmetallic, sunlight-resistant jacket, and must be UL listed for use as a grounding conductor. Fittings must be certified under UL 514B.
5	Must be intermediate steel complying with UL 1242 and ANSI C80.6. The zinc coating must comply with copper sulfate test requirements specified in UL 1242. Fittings must be electrogalvanized and certified under UL 514B.

Bonding bushings installed on metal conduit must be insulated and be galvanized or zinc-alloy type.

Shop-cut threads must be protected from corrosion under the standards shown in the following table:

Shop-Cut Thread Corrosion Protection

Conduit	Standard
Types 1 and 2	ANSI C80.1
Type 5	ANSI C80.6

Primer for metal conduit threads and damaged areas must be on the Authorized Material List for organic zinc-rich primers. Aerosol cans are not allowed.

Conduit for fiber optic cable systems must be schedule 40 high density polyethylene, complying with NEMA TC-7, except for horizontal directional drilling.

Conduit used for horizontal directional drilling must be high density polyethylene Type IPS, SDR 9 and comply with ASTM F2160.

Sealing plug must:

1. Be reusable
2. Withstand a pressure of 5 psi
3. Provide an airtight seal
4. Seal conduit and innerducts simultaneously

Sealing plug for empty conduit must have a rope tie.

Innerduct must be:

1. HDPE tubing or fabric mesh pouch.
2. Nominal 1 inch inside diameter, with a minimum Standard Dimension Ratio (SDR) rating of 11.
3. Continuous without splices or joints.
4. Ribbed inside and outside when used inside a conduit.
5. Ribbed inside and smooth on the outside for direct burial.
6. Unique color throughout the entire length of the conduit segment.

7. Shipped and stored on a reel, covered to protect colors from UV deterioration. The reel must be marked with:
 - 7.1. Manufacturer's name.
 - 7.2. Contract number.
 - 7.3. Size and length of the innerduct.

High density polyethylene for innerduct must:

1. Comply with ASTM D3485, D3035, D2239, and D2447, and NEMA TC7 and TC2
2. Have a minimum tensile yield strength of 3300 psi under ASTM D638
3. Have a density of $59.6187 \text{ lb/ft}^3 \pm 0.3121 \text{ lb/ft}^3$ under ASTM D1505

Tracer wire must be a minimum no. 12 copper conductor with orange insulation Type TW, THW, RHW, or USE. For direct burial, the tracer wire insulation must be Type UF.

86-1.02B(2) Structures Accessories

Steel hangers, steel brackets, and other fittings used to support conduit in or on a wall or bridge structure must comply with section 75-3.

Precast concrete cradles for conduit must be made of minor concrete and commercial-quality welded wire fabric. The minor concrete must contain a minimum of 590 lb of cementitious material per cubic yard. The cradles must be moist cured for a minimum of 3 days.

Expansion-deflection fittings for an expansion joint with a 1-1/2-inch movement rating must be watertight and include a molded neoprene sleeve, a copper bonding jumper, and 2 silicon bronze or zinc-plated iron hubs.

Expansion-deflection fittings for an expansion joint with a movement rating greater than 1-1/2 inches must be as shown.

Conduit expansion and deflection fittings must include a copper bonding jumper with an ampacity rating per NEC.

Replace section 86-1.02C with:

10-18-19

86-1.02C Pull Boxes

86-1.02C(1) General

A pull box cover must have a marking on the top that is:

1. Clearly defined
2. Uniform in depth
3. Parallel to the longer side
4. From 1 to 3 inches in height

The cover marking must include *CALTRANS* and one of the following:

1. *SERVICE* for service circuits from a service equipment enclosure to a subpanel
2. *SERVICE IRRIGATION* for circuits from a service equipment enclosure to an irrigation controller
3. *SERVICE BOOSTER PUMP* for circuits from a service equipment enclosure to the booster pump
4. *TDC POWER* for circuits from a service equipment enclosure to telephone demarcation cabinet
5. *LIGHTING* for a lighting system
6. *SIGN ILLUMINATION* for a sign illumination system
7. *SIGNAL AND LIGHTING* for a signal and lighting system
8. *RAMP METER* for a ramp metering system
9. *TMS* for a traffic monitoring station
10. *FLASHING BEACON* for a flashing beacon system
11. *CMS* for a changeable message sign system
12. *INTERCONNECT* for an interconnect conduit and cable system
13. *FIBER OPTIC* for fiber optic cable system

14. *ELECTRICAL SYSTEMS* if more than one system is shared in the same pull box

The cover marking must not include *CALTRANS*, only the following:

1. *ELECTRICAL SERVICE* for circuits from an electrical utility to a service equipment enclosure
2. *TELEPHONE SERVICE* for circuits from a telephone utility to a telephone demarcation cabinet

A metal pull box cover must include a fitting for a bonding conductor.

The hardware must be stainless steel containing 18 percent chromium and 8 percent nickel.

86-1.02C(2) Roadway Pull Boxes

86-1.02C(2)(a) General

A pull box cover must have a nonskid surface.

The pull boxes and covers must not have exposed fibers or reinforcement on the finish surfaces that are exposed.

The load rating must be:

1. Stenciled or stamped on the inside and outside of the pull box
2. Stamped on the outside of the cover

If a transformer or other device is to be placed in the pull box, include recesses for a hanger.

Hold-down bolts must:

1. Be a Penta Head 1/2-13UNC
2. Have a thread lock material
3. Withstand a torque from 55 to 60 ft-lb
4. Withstand a minimum pull-out strength of 750 lb

The opening in which the cover sets must have length and width dimensions 1/8 inch greater than the cover.

86-1.02C(2)(b) Nontraffic Pull Boxes

A nontraffic pull box and cover must comply with ANSI/SCTE 77, "Specification for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown.

An extended pull box must be a minimum 22 inches deep and may be a single box or a box with an extension made of the same material as the pull box. The extension may be another pull box if the bottom edge of the pull box fits into the opening for the cover.

The hold down bolts, nuts, and washers must be a captive design.

The pull box must have a 1/2-13 coarse-thread insert with drainage hole, to secure the hold down bolts.

The cover must have a 1/2 inches by 4 inches pull slot with a 3/16-inch center pin.

The cover markings must be cast in the mold of the cover or be engraved on a metal or UV resistant ABS plate secured to the cover with stainless steel screws.

86-1.02C(2)(c) Traffic Pull Boxes

A traffic pull box and cover must comply with AASHTO HS20-44 and load tested under AASHTO M 306.

A traffic pull box must be reinforced with a galvanized steel Z bar welded frame. The frame must be anchored to the box with 2-1/4-inch-long concrete anchors with a 1/4-inch diameter. The pull box must have 4 concrete anchors, one in each corner, and two near the middle one on each of the longer sides, except for a no. 3-1/2(T) pull box.

The frame must have nuts fabricated with the frame or spot welded to the underside of the frame, to secure the hold down bolts.

The nuts must be zinc-plated carbon steel, vibration-resistant, and have a wedge ramp at the root of the thread.

The cover must:

1. Be steel, reinforced and galvanized post fabrication.
2. Be countersunk approximately 1/4 inch to accommodate the bolt head. When tightened, the hold down bolt head must be no more than 1/8 inch above the top of the cover.
3. Have a 1/2-inch by 2-inch pull slot with a guard under the cover to prevent entry of more than 3 inches below the bottom surface of the cover without deflection.

Before galvanizing a steel cover, the manufacturer must apply the cover marking by one of the following methods:

1. Use a cast iron strip at least 1/4-inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover with 1/4-inch, flathead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
2. Use a sheet steel strip at least 0.027-inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover by spot welding, tack welding, or brazing with 1/4-inch stainless steel rivets or 1/4-inch, roundhead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
3. Bead weld the letters on the cover such that the letters are raised a minimum of 3/32 inch.

86-1.02C(2)(d) Tamper Resistant Pull Boxes

86-1.02C(2)(d)(i) General

Not Used

86-1.02C(2)(d)(ii) Tamper-Resistant Nontraffic Pull Box

86-1.02C(2)(d)(ii)(A) General

A tamper resistant nontraffic pull box must include a pull box with one of the following:

1. Anchored cover
2. Lockable cover
3. Pull box insert

86-1.02C(2)(d)(ii)(B) Anchored Cover

The anchored cover must:

1. Be of 1/2-inch-thick mild steel, hot dip galvanized, post fabrication.
2. Have spikes removed from the galvanized surfaces.
3. Have a center space for a top lock nut that must be torqued to 200 ft-lb.
4. Have a center opening for a stainless-steel threaded cap to cover the lock nut.
5. Weigh a minimum of 85 lb.
6. Include an all-around security skirt of 1/4-inch thick steel. The skirt must be sized to encase a nontraffic pull box or sized to fit within a traffic pull box.
7. Be welded to the skirt.

86-1.02C(2)(d)(ii)(C) Lockable Cover

The lockable cover must:

1. Be manufactured from minimum 3/16-inch-thick galvanized steel or a polymer of minimum strength equal to 3/16-inch steel.
2. Be secured to the pull box with a locking mechanism of equal or greater strength than the manufactured material.
3. Have 1/2-by-2-inch slot holes for lifting.
4. Have dimensions complying with one of the following:
 - 4.1. Department's standards for pull box covers as shown if the lockable cover is secured to the inside lip of the pull box.
 - 4.2. Department's standards for the length and width as shown for pull box covers if the lockable cover is secured to the top of the pull box.

86-1.02C(2)(d)(ii)(D) Pull Box Insert

The pull box insert must:

1. Be made of minimum 3/16-inch-thick or 10 gauge mild hot-dipped galvanized steel
2. Have a minimum of 2 mounting brackets that rest under the side or end wall
3. Be lockable with a padlock having a minimum 3/8-inch shackle
4. Have dimensions complying with the Department's standards for the length and width as shown for pull box covers

86-1.02C(2)(d)(iii) Tamper Resistant Traffic Pull Box

A tamper resistant traffic pull box must include a pull box with an anchored cover.

86-1.02C(3) Structure Pull Boxes

A no. 7 pull box must:

1. Be 12 by 12 by 12 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have 3/4-inch flanges on the top and bottom.
4. Have one 1-inch and one 1-1/2-inch knockouts on each side, except for the covers 10-16-20
5. Have drilled and tapped holes on the top and the bottom flanges for the cover screws. The hole pattern and spacing must be the same at the top and bottom. 10-18-19
6. Have covers that secure to the box with eight 1/4-inch diameter, 20NC brass machine screws.

A no. 8 pull box must:

1. Be 12 by 12 by 12 inches.
2. Be manufactured with 0.135-inch sheet steel.
3. Mount to the structure with three 3/8-inch diameter machine screws per side.
4. Have 1-1/2-inch knockouts on each side, except the cover. 10-16-20
5. Have drilled and tapped holes on the sides and the bottom for the cover screws. The holes must be reinforced with a 1-by-1-by-0.135-inch bar inside the box. 10-18-19
6. Have a cover with 3/4-inch flanges on the sides and bottom with the corners welded at the bottom. The cover must secure to the box with, three 1/4-inch diameter by 1/2-inch long cadmium plated brass or stainless steel, machine screws.

A no. 9 pull box must:

1. Be 24 by 9-1/2 by 6-1/4 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have a rain tight hood.
4. Have a 1-1/2-by-4-1/2-by-0.135-inch strap welded to the back of the box at each corner, parallel to the long side. The strap must have a 1/4-inch hole on the exposed end.
5. Have a 1-inch lip around the opening. 10-16-20
6. Have drilled and tapped holes with a minimum 1/4-inch thread length, at the ends of the bottom lip for the cover screws. 10-18-19
7. Have a 3-inch knockout on each side at the bottom and at the center of the bottom.
8. Have a 2-inch knockout on each side at the top and at both ends of the bottom.
9. Have an L 5/8-by-7/8-by-0.075-inch formed angle spot welded to the inside of the top on both sides and on the bottom.
10. Have a cover manufactured with 0.125-inch steel, that secures to the box with two 3/8-inch diameter by 3/4-inch long stainless-steel flathead screws with 11/16-inch diameter countersink holes. The cover must include a 1/16-inch neoprene gasket.

A no. 9A pull box must:

1. Be 20 by 8 by 8-1/2 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have 3/4-inch flanges on the top.
4. Have drilled holes on the short sides for the cover screws. The holes must have a stainless-steel hex nut or a 1/4-by-5/8-by-8-inch bar spot welded to the bottom of the flange.
5. Have a 3-inch knockout on each side at the top and at the center of the bottom.
6. Have a 2-inch knockout on each side at the bottom and at both ends of the bottom.
7. Have a cover manufactured with 0.105-inch steel, that secures to the box with four 3/8-inch diameter stainless steel hex head cap screws, two on each short side. The cover must have a rain tight hood and include a 1/16-inch neoprene gasket.

Pull box corner joints must be lapped and spot welded or riveted.

Concentric and eccentric multiple size knockouts are not be allowed.

Replace section 86-1.02D(3) with:

10-19-18

86-1.02D(3) Warning Tape

Warning tape must be orange color polyolefin film, minimum elongation of 500 percent before breakage, water and corrosion resistant, and comply with requirements shown in the following table:

Warning Tape Requirements

Quality characteristic	Requirement
Thickness (min, mil)	4
Width (in)	4
Tensile strength of material (min, psi)	2800
Message spacing intervals (ft)	3

The warning tape must have a printed message that reads: *CAUTION: CALTRANS FACILITIES BELOW.*

The printed text height and color must be 1 inch, black color text over bright orange background.

Replace the 2nd paragraph of section 86-1.02E with:

10-19-18

Each sensor must:

1. Have a dissipation factor less than 0.04 nF when measured in the 20 nF range
2. Have resistance greater than 20 Megaohms
3. Be 1/4 inch wide by 6 feet long by 1/16 inch thick
4. Have a RG-58C/U coaxial screen transmission cable, jacketed with high-density polyethylene, rated for direct burial and resistant to nicks and cuts
5. Operate over a temperature range from -40 to 160 degrees F
6. Have a signal to noise ratio equal to or greater than 10 to 1
7. Have an output signal of a minimum 250 mV ± 20 percent for a wheel load of 400 lb at 55 mph and 70 degrees F
8. Have an insulation resistance greater than 500 MΩ
9. Have a life cycle of a minimum 25 million equivalent single axle loadings

Replace section 86-1.02F(1) with:

10-19-18

86-1.02F(1) General

Conductors and cables must be clearly and permanently marked the entire length of their outer surface with:

1. Manufacturer's name or trademark
2. Insulation-type letter designation
3. Conductor size
4. Voltage
5. Number of conductors for a cable

The minimum insulation thickness and color code requirements must comply with NEC.

Replace the 2nd paragraph of section 86-1.02F(2)(a) with:

10-19-18

Conductors must be identified as shown in the following table:

Conductor Identification

04-17-20

Circuit	Signal phase or function	Identification		Band symbols	Copper size
		Insulation color			
		Base	Stripe ^a		

Signals (vehicle) ^{a,b}	2, 6	Red, yellow, brown	Black	2, 6	14
	4, 8	Red, yellow, brown	Orange	4, 8	14
	1, 5	Red, yellow, brown	None	1, 5	14
	3, 7	Red, yellow, brown	Purple	3, 7	14
	Ramp meter 1	Red, yellow, brown	None	No band required	14
	Ramp meter 2	Red, yellow, brown	Black	No band required	14
Pedestrian signals	2p, 6p	Red, brown	Black	2p, 6p	14
	4p, 8p	Red, brown	Orange	4p, 8p	14
	1p, 5p	Red, brown	None	1p, 5p	14
	3p, 7p	Red, brown	Purple	3p, 7p	14
Push button assembly or accessible pedestrian signal	2p, 6p	Blue	Black	P-2, P-6	14
	4p, 8p	Blue	Orange	P-4, P-8	14
	1p, 5p	Blue	None	P-1, P-5	14
	3p, 7p	Blue	Purple	P-3, P-7	14
Traffic signal controller cabinet	Ungrounded circuit conductor	Black	None	CON-1	6
	Grounded circuit conductor	White	None	CON-2	6
Highway lighting pull box to luminaire	Ungrounded - line 1	Black	None	No band required	14
	Ungrounded - line 2	Red	None	No band required	14
	Grounded	White	None	No band required	14
Multiple highway lighting	Ungrounded - line 1	Black	None	ML1	10
	Ungrounded - line 2	Red	None	ML2	10
	Ungrounded - line 3	White	None	ML3	10
Lighting control	Ungrounded - Photoelectric unit	Black	None	C1	14
	Switching leg from Photoelectric unit or SM transformer	Red	None	C2	14
Service	Ungrounded - line 1 (signals)	Black	None	No band required	6
	Ungrounded - line 2 (lighting)	Red	None	No band required	8
Sign lighting	Ungrounded - line 1	Black	None	SL-1	10
	Ungrounded - line 2	Red	None	SL-2	10
Flashing beacons	Ungrounded between flasher and beacons	Red or yellow	None	FB-Location. ^c	14
Grounded circuit conductor	Push button assembly or accessible pedestrian signal	White	Black	No band required	14
	Signals and multiple lighting	White	None	No band required	10
	Flashing beacons and sign lighting	White	None	No band required	12
	Lighting control	White	None	C-3	14
	Service	White	None	No band required	14

Spares		Black	None	No band required	14
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Notes:

^aOn overlaps, the insulation is striped for the 1st phase in the designation, e.g., phase (2+3) conductor is striped as for phase 2.

^bBand for overlap and special phases as required

^cFlashing beacons having separate service do not require banding.

Delete the 4th paragraph of section 86-1.02F(2)(a).

10-19-18

Replace the 2nd paragraph of section 86-1.02F(2)(c)(ii) with:

10-19-18

An equipment grounding conductor must be insulated.

Replace the 3rd paragraph of section 86-1.02F(3)(d)(ii) with:

10-19-18

Cable must comply with the requirements shown in the following table:

Cable type	Conductor quantity and type	Cable jacket thickness (mils)		Maximum nominal outside diameter (inch)	Conductor color code
		Average	Minimum		

3CSC	3 no. 14	44	36	0.40	Blue/black stripe, blue/orange stripe, white/black stripe
5CSC	5 no. 14	44	36	0.50	Red, yellow, brown, black, white
9CSC	1 no. 12 8 no. 14	60	48	0.65	No. 12 - white, No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, white/black stripe
12CSC	1 no. 12 11 no. 14	60	48	0.80	No. 12 - white No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, black/red stripe, black/white stripe, red/white stripe, brown/white stripe
28CSC	1 no. 10 27 no. 14	80	64	0.90	No. 10 - white No. 14 - red/black stripe, yellow/black stripe, brown/black stripe, red/orange stripe, yellow/orange stripe, brown/orange stripe, red/silver stripe, yellow/silver stripe, brown/silver stripe, red/purple stripe, yellow/purple stripe, brown/purple stripe, red/2 black stripes, brown/2 black stripes, red/2 orange stripes, brown/2 orange stripes, red/2 silver stripes, brown/2 silver stripes, red/2 purple stripes, brown/2 purple stripes, blue/black stripe, blue/orange stripe, blue/silver stripe, blue/purple stripe, white/black stripe, black/red stripe, black

Replace section 86-1.02F(3)(d)(iv) with:

10-15-21

86-1.02F(3)(d)(iv) Railroad Preemption Cables

A railroad preemption cable must be an 18-conductor cable having a polyvinyl chloride or polyethylene jacket. The cable jacket must be rated for 600 V(ac) and 75 degrees C.

The railroad preemption cable color code must be as shown in the following table:

Conductor no.	Color Code
1	Black
2	White
3	Red
4	Green
5	Orange
6	Blue
7	White/black stripe
8	Red/black stripe
9	Green/black stripe
10	Orange/black stripe
11	Blue/black stripe
12	Black/white stripe
13	Red/white stripe
14	Green/white stripe
15	Blue/white stripe
16	Black/red stripe
17	White/red stripe
18	Orange/red stripe

The individual conductors in the cable must:

1. Be stranded and comply with ASTM B286
2. Have Type THW insulation
3. Be 14 AWG

Replace the 3rd paragraph of section 86-1.02G with:

10-19-18

The self-adhesive reflective labels must:

1. Be from 3 to 5 mils thick
2. Have all black capital characters on a white background
3. Extend beyond the character by a minimum of 1/4 inch

Replace the 4th paragraph of section 86-1.02H with:

10-19-18

PVC electrical tape must have a minimum thickness of 6 mils.

Replace section 86-1.02K with:

04-17-20

86-1.02K Luminaires

86-1.02K(1) General

A luminaire must:

1. Be self-contained, not requiring assembly.
2. Comply with UL 1598 for luminaires in wet locations.
3. Have a power supply with ANSI/IEC 60529 rating of at least IP65.
4. Weigh less than 35 lb.
5. Have a minimum 60,000 hours L70 rating under LM-80 and TM-21 at an ambient temperature of 25 degrees C.
6. Operate over a temperature range from -40 to 130 degrees F.
7. Be operationally compatible with photoelectric controls.
8. Have a nominal correlated color temperature of 3000 K under ANSI C78.377 and a color rendering index of 70 or greater.
9. Have a maximum effective projected area of 1.4 sq ft when viewed from either side or end.
10. Comply with ANSI C136.31.
11. Have a power factor of 0.90 or greater. The total harmonic distortion, current, and voltage induced into a power line by a luminaire must not exceed 20 percent. Test voltage will be at 120 V(ac), 240 V(ac), or 480 V(ac).

04-15-22

12. Comply with the maximum power consumption and isofootcandle curves as shown, except for roadway luminaires.

04-17-20

13. Be on the Authorized Material List for LED luminaires or must be submitted and passed testing for addition to the AML.

A luminaire must include a surge protection device to withstand high-repetition noise transients caused by utility line switching, lightning strikes, and other interferences. The device must protect the luminaire from damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The surge protection device must comply with UL 1449 and ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

The luminaire must operate over the voltage range:

1. From 95 to 277 V(ac) for luminaires rated 120, 240, or 277 V(ac)
2. From 347 to 480 V(ac) for luminaires rated 480 V(ac)

The fluctuations of line voltage must have no visible effect on the luminous output.

The luminaire's housing, external bolts, screws, hinges, hinge pins, and door closure devices must withstand a 1008 hour cyclic salt fog spray/UV test under ASTM D5894 and an evaluation under ASTM D714 with a blister rating of 8 or greater and no more than medium density.

The luminaire's housing must be marine-grade alloy with less than 0.2 percent copper or die cast aluminum.

The housing must be designed to prevent the buildup of water on its top surface. Exposed heat sink fins must be oriented to allow water to run off the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an ANSI/IEC 60529 rating of IP66. The power supply enclosure must be protected to at least an ANSI/IEC 60529 rating of IP43.

If the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire's housing separately from other components. The door must be secured to the housing to prevent accidental opening. A safety cable must mechanically connect the door to the housing.

A luminaire must have a barrier-type terminal block secured to the housing to connect field wires. The terminal screws must be captive and equipped with wire grips for conductors up to no. 6.

Terminals must be identified and marked.

If needed, each refractor or lens must be made of UV-inhibiting high-impact plastic, such as acrylic or polycarbonate, or heat and impact-resistant glass. The refractor or lens must be resistant to scratching. Polymeric materials, except for the lenses of enclosures containing either the power supply or electronic components of the luminaire, must be made of UL94 V-0 flame-retardant materials.

The luminaire must be permanently marked inside the unit and outside of its packaging box. Marking consists of:

1. Manufacturer's name or trademark
2. Month and year of manufacture
3. Model, serial, and lot numbers
4. Rated voltage, wattage, and power in VA

An LED luminaire must:

1. Comply with Class A emission limits under 47 CFR 15(B) for unintentional radiators.
2. Have a power supply with:
 - 2.1. 2 leads to accept standard 0-10 V(dc) control.
 - 2.2. Dimming control compatible with IEC 60929, Annex E. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.
 - 2.3. Case temperature self-rise of 77 degrees F or less above ambient temperature in free air with no additional heat sinks.
3. Not be cooled by fans or other mechanical devices.

86-1.02K(2) Roadway Luminaires

A roadway luminaire must:

1. Have a housing color that matches a color no. 26152 to 26440, 36231 to 36375, or 36440 of AMS-STD-595
2. Have an ANSI C136.41-compliant, locking-type, photocontrol receptacle with dimming connections and a watertight shorting cap
3. Have an upright rating of "U0" per IES TM-15-11
4. Have identification labels outside the unit on the side that will face the road. The labels include:
 - 4.1. Equipment identification characters as shown in the following table:

04-15-22

Equipment Identification Characters

Luminaire Type	Label
Roadway 11	R11
Roadway 12	R12
INT S-A	SA
INT S-B	SB
INT S-C	SC
INT M-A	MA
INT M-B	MB
INT M-C	MC
INT L-A	LA
INT L-B	LB
INT L-C	LC

- 4.2. Rated wattage

04-17-20

The luminaire's housing must have a slip fitter that must:

1. Fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches

2. Be adjustable to a minimum of ± 5 degrees from the axis of the tenon in a minimum of 5 steps: +5, +2.5, 0, -2.5, -5
3. Have clamping brackets that:
 - 3.1. Are made of corrosion-resistant materials or treated to prevent galvanic reactions
 - 3.2. Do not bottom out on the housing bosses when adjusted within the designed angular range
 - 3.3. Do not permanently set more than 1/32 inch when tightened

86-1.02K(3) Overhead Sign Luminaires

An overhead sign luminaire must:

1. Have a uniformity average to minimum ratio of 10:1 for the distribution of light reflected on a 16' wide by 12' high sign panel
2. Not allow more than 2.5 percent of the rated lumens to project above 65 degrees measured up from the horizontal plane in the direction of the sign panel
3. Mount at a maximum height of 12 inches above the top of the mounting rails
4. Mount directly to the sign structure as shown or with a mounting adapter that meets the material requirements of the luminaire's housing

Replace section 86-1.02M with:

10-19-18

86-1.02M Photoelectric Controls

Photoelectric control types are as shown in the following table:

Photoelectric Control Types

Control type	Description
I	Pole-mounted photoelectric unit. Test switch and a 15-A circuit breaker per ungrounded conductor, housed in an enclosure.
II	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.
III	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and a test switch housed in an enclosure.
IV	A photoelectric unit that plugs into a NEMA twist-lock receptacle, integral with the luminaire.
V	A photoelectric unit, contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.

The pole-mounted adaptor for Type I, II, and III photoelectric controls must include a terminal block and cable supports or clamps to support the wires.

Photoelectric unit must:

1. Have a screen to prevent artificial light from causing cycling.
2. Have a rating of 60 Hz, 105-130 V(ac), 210-240 V(ac), or 105-240 V(ac).
3. Operate at a temperature range from -20 to 55 degrees C.
4. Consume less than 10 W.
5. Be a 3-prong, twist-lock type with a NEMA IP 65 rating, ANSI C136.10-compliant.
6. Have a fail-on state.
7. Fit into a NEMA-type receptacle.
8. Turn on from 1 to 5 footcandles and turn off from 1.5 to 5 times the turn-on level. Measurements must be made by procedures in *EEI-NEMA Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting*.

Type I, II, III, and V photoelectric controls must have a test switch to allow manual operation of the lighting circuit. Switch must be:

1. Single-hole mounting, toggle type
2. 15 A, single pole and single throw

3. Labeled *Auto-Test* on a nameplate

Photoelectric control's contactor must be:

1. Normally open
2. Mechanical-armature type with contacts of fine silver, silver alloy, or equal or better material
3. Installed to provide a minimum space of 2-1/2 inches between the contactor terminals and the enclosure's sides

The terminal blocks must be rated at 25 A, 600 V(ac), molded from phenolic or nylon material, and be the barrier type with plated-brass screw terminals and integral marking strips.

Replace section 86-1.02N with:

10-19-18

86-1.02N Fused Splice Connectors

The fused splice connector for 240 and 480 V(ac) circuits must simultaneously disconnect both ungrounded conductors. The connector must not have exposed metal parts except for the head of the stainless steel assembly screw. The head of the assembly screw must be recessed a minimum of 1/32 inch below the top of the plastic boss that surrounds the head.

The connector must protect the fuse from water or weather damage. Contact between the fuse and fuse holder must be spring loaded.

Fuses must:

1. Be standard, midget, ferrule type
2. Have a nontime-delay feature
3. Be 13/32 by 1-1/2 inches

Fuse ratings for luminaires are shown in the following table:

Fuse Current Rating Requirements		
Circuit voltage	Fuse voltage rating	Soffit and roadway luminaires
120 V(ac)	250 V(ac)	5 A
240 V(ac)	250 V(ac)	5 A
480 V(ac)	500-600 V(ac)	5 A

Fuse ratings for transformers are shown in the following table:

Fuse Current Rating Requirements				
Circuit voltage	Fuse voltage rating	Fuse current rating for Single phase (two wires) Transformers (primary side)		
		1 kVA	2 kVA	3 kVA
120 V(ac)	250 V(ac)	10 A	20 A	30 A
240 V(ac)	250 V(ac)	6 A	10 A	20 A
480 V(ac)	500-600 V(ac)	3 A	6 A	10 A

Replace section 86-1.02P(1) with:

10-19-18

86-1.02P(1) General

The enclosures must be rated NEMA 3R and include a dead front panel and a hasp with a 7/16-inch-diameter hole for a padlock.

Except for a service equipment enclosure, an enclosure must:

1. Be manufactured from steel and either galvanized, cadmium plated, or powder coated
2. Mount to a standard, pole, post, or sign structural frame
3. Provide a minimum space of 2-1/2 inches between the internal components and the enclosure's sides

The enclosure's machine screws and bolts must not protrude outside the cabinet wall.

The fasteners on the exterior of an enclosure must be vandal resistant and not be removable. The exterior screws, nuts, bolts, and washers must be stainless steel.

Replace the 1st paragraph of section 86-1.02P(2) with:

04-19-19

Service equipment enclosure must:

1. Comply with the Electric Utility Service Equipment Requirements Committee
2. Meet the requirements of the service utility
3. Be watertight
4. Be factory wired and manufactured from steel and galvanized or have factory-applied, rust-resistant prime and finish coats, except Types II and III
5. Be marked as specified in NEC to warn of potential electric-arc flash hazards

Delete the 5th paragraph of 86-1.02P(2).

04-19-19

Add between 6th and 7th paragraphs of section 86-1.02P(2):

10-19-18

Service equipment enclosure must have the meter view windows located on the front side of the enclosure for Types III-AF, BF, CF and DF.

Service equipment enclosure must have the meter view windows located on the back side of the enclosure for Types III-AR, BR, CR and DR.

Replace the 7th paragraph of section 86-1.02P(2) with:

04-19-19

The meter area must have a sealable, lockable, weather-tight cover that can be removed without the use of tools.

Delete the 2nd sentence of the 9th paragraph of section 86-1.02P(2).

04-19-19

Delete section 86-1.02P(3).

10-19-18

Replace section 86-1.02Q with:

10-15-21

86-1.02Q Cabinets

86-1.02Q(1) General

Cabinets must be factory wired except for battery backup system cabinets.

The fasteners on the exterior of a cabinet, except for battery backup system cabinets, must be removable and vandal resistant. The exterior screws, nuts, bolts, and washers must be stainless steel.

Terminal blocks, circuit breakers, and a power supply must be UL approved.

86-1.02Q(2) Controller Cabinets

86-1.02Q(2)(a) General

The controller cabinet must comply with TEES and include anchor bolts.

86-1.02Q(2)(b) Department-Furnished Controller Cabinets

The Department furnishes the controller unit, controller cabinet, and all auxiliary equipment required to operate the system. The Department does not furnish anchor bolts.

86-1.02Q(3) Telephone Demarcation Cabinets

86-1.02Q(3)(a) General

The doors of a telephone demarcation cabinet must be attached using continuous aluminum steel piano hinges.

86-1.02Q(3)(b) Type A Telephone Demarcation Cabinets

Reserved

86-1.02Q(3)(c) Type B Telephone Demarcation Cabinets

A Type B telephone demarcation cabinet consists of a mounting panel, outlets, circuit breaker, fan, dead front plates, and fuse.

The mounting panel must be made of 3/4-inch-thick ACX-grade plywood.

The mounting panel must be fastened to the cabinet with nuts, lock washers, and flat washers to 10 welded studs.

The cabinet must be made of 0.125-inch-thick anodized aluminum.

The cabinet door must be hung and secured with drawn latches, lockable with a padlock. The padlock latches must each have a minimum 7/16-inch-diameter hole.

Ventilation louvers must be located on the door.

The fan must be located in a ventilator housing and be controlled thermostatically. The thermostat control must have a range from 80 to 130 degrees F.

The thermostat and fan circuit must be protected with a fuse rated for 175 percent of the motor capacity. The fan capacity must be a minimum 25 cfm.

86-1.02Q(3)(d) Type C Telephone Demarcation Cabinets

Reserved

86-1.02Q(4) Battery Backup System Cabinets

A battery backup system includes the cabinet, batteries, and the Department-furnished electronics assembly.

The electronics assembly includes the inverter/charger unit, manual bypass, and the battery harness.

The cabinet for a battery backup system must:

1. Comply with TEES
2. Be submitted and pass testing for addition to the Authorized Material List

Add between the 2nd and 3rd paragraphs of section 86-1.02R(2):

Bracket arms must be long enough to allow proper alignment of signals and backplate installation.

10-19-18

Replace the 2nd paragraph for section 86-1.02R(3) with:

04-16-21

A metal backplate must be made of a minimum 1/16-inch-thick aluminum alloy 3003-H14.

Add to the end of section 86-1.02R(3):

04-17-20

Backplates for signal and lighting systems must have a 2-inch retroreflective strip on the face around the perimeter. The strip must be Type XI fluorescent yellow retroreflective sheeting on the Authorized Material List for signing and delineation materials.

Replace item 2 in the list in the 5th paragraph of section 86-1.02R(4)(a)(iii) with:

10-19-18

- 2. Be a black color throughout, including the door, matching color no. 17038, 27038, or 37038 of AMS-STD-595

Replace section 86-1.02S(3)(c) with:

04-17-20

86-1.02S(3)(c) LED Countdown Pedestrian Signal Face Modules

10-15-21

An LED countdown pedestrian signal face module must be on the Authorized Material List for LED countdown pedestrian signal face modules.

04-17-20

An LED countdown PSF module must:

- 1. Comply with ITE publication ST-055-E, Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules.
- 2. Be manufactured with materials that comply with ASTM D3935.
- 3. Have circuit boards that comply with TEES, chapter 1, section 6.
- 4. Have symbols that are at least 9 inches high and 5-1/4 inches wide each. The 2-digit countdown display, *Upraised Hand*, and *Walking Person* indications must be electronically isolated from each other. The 3 indications must not share a power supply or interconnect circuitry.
- 5. Use ultra-bright-type LED rated for 60,000 hours of continuous operation. Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.
- 6. Have a manual control to turn on and off the 2-digit countdown display.
- 7. Have the lot number, month, and year of manufacture permanently marked on the back.
- 8. Have prominent and permanent vertical markings for accurate indexing and orientation within the pedestrian signal housing. Markings must be a minimum of 1 inch in height and include an up arrow and the word *up* or *top*.

Upon initial testing at 25 degrees C, the module must have at least the luminance values shown in the following table:

Luminance Values

PSF module symbol	Luminance (fL)
Upraised hand and 2-digit countdown timer	1,094
Walking person	1,547

The module must not exceed the power consumption requirements shown in the following table:

Maximum Power Consumption Requirements

PSF module display	At 24 °C	At 74 °C
<i>Upraised Hand</i>	10.0 W	12.0 W
<i>Walking Person</i>	9.0 W	12.0 W
2-digit countdown timer	6.0 W	8.0 W

If the pedestrian change interval is interrupted, then the 2-digit countdown timer and display must reset to the full pedestrian change interval before being initiated the next time. The 2-digit countdown display on the PSF module must go dark within a second after displaying "0".

Replace section 86-1.02T with:

10-15-21

86-1.02T Accessible Pedestrian Signals

Accessible pedestrian signal (APS) must be on the Authorized Material List for Accessible Pedestrian Signals.

An APS must comply with the *California MUTCD*, chapter 4E, and must:

1. Have an audible speech message that plays when the push button is actuated. The accessible pedestrian signal must have at least 5 audible message options.
2. Have a push button locator tone that clicks or beeps.
3. Allow the pushbutton to activate the pedestrian phase during any failure of the APS features.
4. Have a controllable and programmable volume level and messaging.
5. Be weatherproof and shockproof.
6. Weigh 7 lb maximum.
7. Measure 16 by 6 by 5 inches, maximum.
8. Have a switch for a push button.
9. Have a vibrotactile device on the push button or on the arrow.
10. Have an internal weatherproof speaker.
11. Have a microphone that senses the ambient sound level.
12. Include touch-free technology.

Theft-proof bolts used for mounting the enclosure to the standard must be stainless steel with a content of 17 percent chromium and 8 percent nickel. The enclosure must be shaped to fit the pole's curvature.

The color of a metallic enclosure must match color no. 33538 of AMS-STD-595.

The color of a plastic enclosure must match color no. 17038, 27038, or 37038 of AMS-STD-595.

The separation between adjacent holes used for conductors and mounting must be at least twice the diameter of the larger hole.

The speaker grills must be located on the surface of the enclosure. The speakers must not interfere with the enclosure or its mounting hardware.

The signal interface cable between the APS and the pedestrian signal head must be rated for outdoor use and have:

1. Four no. 18 stranded tinned copper conductors with a minimum insulation thickness of 15 mils
2. Cable jacket with a minimum thickness of 20 mils and rated for a minimum:
 - 2.1. 300 V(ac)
 - 2.2. 176 degrees F
3. Nominal outside diameter less than 350 mils
4. Conductor color code of black, white, red, and green

Touch-free technology must:

1. Activate a pedestrian phase when a pedestrian hand motion is detected during a set time interval
2. Have user adjustable detection area and time interval parameters

2. Pull boxes
3. Cabinets
4. Service equipment enclosures
5. Standards

The digital file must consist of:

1. Longitudinal and latitude coordinates, under the WGS84 reference coordinate system. The coordinates must be in decimal format having 6 significant figures after the decimal point. Coordinates must be read at the center of pull boxes, cabinet, standards, and service equipment enclosures; and on top of conduit at 20-foot intervals before backfill.
2. Type, depth and size for conduits.
3. Type for pull boxes, standards, cabinets, and service equipment enclosures.

Replace item 4 in the list in the 1st paragraph of section 87-1.01D(2)(a) with:

4. Luminaires

10-19-18

Replace the 2nd paragraph of section 87-1.01D(2)(a) with:

Submit a sample size as shown in the following table:

10-18-19

Electrical Material Sampling

Contract quantity	Test sample size
1–8	1
9–15	2
16–25	3
26–90	5
91–150	8
151–280	13
281–500	20
501–1200	32

Replace the 2nd paragraph of section 87-1.01D(2)(c) with:

10-16-20

Test the battery backup system in the presence of the Engineer by turning off the service power to the electrical system to be powered by the battery backup system. The electrical system must remain in full continuous operation for 30 minutes. If the test fails, correct the problem and retest the system. After successful completion of the test, turn on the service power for the electrical system.

Replace section 87-1.01D(2)(d) with:

10-19-18

87-1.01D(2)(d) Piezoelectric Axle Sensors

Piezoelectric axle sensors test consists of:

1. Demonstrating for each sensor:
 - 1.1. Capacitance is within 20 percent of the value shown on the sensor's data sheet
 - 1.2. Dissipation factor is less than 0.04 nF when measured in the 20 nF range
 - 1.3. Resistance is greater than 20 Megaohms
2. Collecting a minimum of 100 vehicle records for each lane and demonstrating:
 - 2.1. Volume is within ±3 percent accuracy

2.2. Vehicle classification is within 95 percent accuracy by type

Replace the 7th paragraph of section 87-1.03A with:

10-19-18

Notify the Engineer immediately if an existing facility is damaged by your activities:

1. Damaged existing traffic signal systems must be repaired or replaced within 24 hours. If the system cannot be fixed within 24 hours or it is located on a structure, provide a temporary system until the system can be fixed.
2. Damaged existing lighting systems must be repaired or replaced by nightfall. If the system cannot be fixed by nightfall, provide a temporary system until the system can be fixed.

Add to the end of section 87-1.03A:

10-19-18

Collect the geographic information system mapping data.

Replace section 87-1.03B with:

04-15-22

87-1.03B Conduit Installation

87-1.03B(1) General

The installation of conduit includes installing caps, bushings, and pull tape and terminating the conduit in pull boxes, foundations, poles, or a structure.

Limit the number of bends in a conduit run to no more than 360 degrees between pull points.

Use conduit to enclose conductors except where they are installed overhead or inside standards or posts.

You may use a larger size conduit than specified for the entire length between termination points. Do not use a reducing coupling.

Extend an existing conduit using the same material. Terminate conduits of different materials in a pull box.

Use a minimum trade size of conduit of:

1. 1-1/2 inches from an electrolier to the adjacent pull box.
2. 1 inch from a pedestrian push button post to the adjacent pull box.
3. 2 inches from a signal standard to the adjacent pull box.
4. 3 inches from a controller cabinet to the adjacent pull box. Install two 3-inch conduits between controller cabinet and adjacent pull box.
5. 2 inches from an overhead sign to the adjacent pull box.
6. 2 inches from a service equipment enclosure to the adjacent pull box.
7. 1-1/2 inches if unspecified.

Make conduit cuts square and true.

Thread metal conduit with standard conduit-threading dies.

Ream the ends of shop-cut and field-cut conduit to remove burrs and rough edges.

Do not use slip joints or running threads to couple metal conduit. If a standard coupling cannot be used, use a threaded union coupling. Tighten couplings for metal conduit to maintain a good electrical connection.

Use Type 1 conduit:

1. On all exposed surfaces

2. In concrete structures
3. Between a structure and the nearest pull box

Cut Type 2 conduit with pipe cutters; do not use hacksaws. Tighten conduit into couplings or fittings using strap wrenches or approved groove joint pliers.

Apply 2 coats of unthinned primer and paint all metal conduit:

1. Exposed threads
2. Field-cut threads, before installing conduit couplings
3. Damaged surfaces

Do not remove shop-installed conduit couplings.

Repair damaged Type 2 conduit and coupling coating by:

1. Cleaning the conduit or coupling and painting it with 1 coat of rubber-resin-based adhesive under the manufacturer's instructions. Wrap the damaged area with at least 1 layer of 2-inch-wide, 20 mils-minimum-thickness, PVC tape under ASTM D1000 with a minimum tape overlap of 1/2 inch.
2. Painting damaged spots of 1/4 inch or less in diameter with a brushing-type compound supplied by the conduit manufacturer.

Cut Type 3 conduit with tools that do not deform the conduit. Use solvent weld connections.

If factory bends are not used, bend the conduit to a radius no less than 6 times its inside diameter without crimping or flattening it. Comply with the bending requirements shown in the following table:

Conduit-Bending Requirements

Type	Requirement
1	Use equipment and methods under the conduit manufacturer's instructions.
2	Use a standard bending tool designed for use on thermoplastic-coated conduit. The conduit must be free of burrs and pits.
3	Use equipment and methods under the conduit manufacturer's instructions. Do not expose the conduit to a direct flame.
5	Use equipment and methods under the conduit manufacturer's instructions.

Do not install new conduit through foundations.

Install conduit terminating in a standard or pedestal from 2 to 3 inches above the foundation. Slope the conduit toward the handhole opening.

Terminate conduit installed through the bottom of a nonmetallic pull box 2 inches above the bottom and 2 inches from the wall closest to the direction of the run.

Cap the ends of conduit for future use or until installation of conductors or cables. Cap the threaded ends of metal conduit with standard pipe caps. Install a plastic cap on all other types of conduit.

Install threaded bushings on metal conduits and bond them using a jumper. Install nonmetallic bushings or end bells on other types of conduit.

Install pull tape in conduit or innerducts to remain empty, with at least 2 feet of slack at each end. Attach the tape's ends to the conduit.

87-1.03B(2) Conduit Installation for Structures

87-1.03B(2)(a) General

Paint exposed Type 1 conduit the same color as the structure.

Install galvanized steel hangers, steel brackets, and other fittings to support conduit in or on a wall or bridge structure.

Install an expansion fitting at structure expansion joints with a movement rating of less than 1-1/2 inch.

Install a conduit expansion-deflection fitting at structure expansion joints with a movement rating of 1-1/2 inch or greater.

87-1.03B(2)(b) New Structures

Seal and make watertight the conduits which lead to soffits, wall-mounted luminaires, other lights, and fixtures located below the pull box grade.

If you place a conduit through the side of a nonmetallic pull box, terminate the conduit 2 inches from the wall and 2 inches above the bottom. Slope the conduit toward the top of the box.

For ease of installation and if authorized, you may use Type 4 conduit instead of Type 1 conduit for the final 2 feet of conduit entering a pull box in a reinforced concrete structure.

For conduit installed inside of bridge structures, you must:

1. Install precast concrete cradles.
2. Bond precast concrete cradles to a wall or bridge structure with one of the following:
 - 2.1. Epoxy adhesive for bonding freshly-mixed concrete to hardened concrete.
 - 2.2. Rapid-set epoxy adhesive for pavement markers.
 - 2.3. Standard-set epoxy adhesive for pavement markers.
3. Use a pipe sleeve or form an opening for a conduit through a bridge structure. The sleeve or opening through a prestressed member or conventionally reinforced precast member must be:
 - 3.1. Oriented transverse to the member.
 - 3.2. Located through the web.
 - 3.3. No more than 4 inches in size.
4. Wrap the conduit with 2 layers of asphalt felt building paper and securely tape or wire the paper in place for a conduit passing through a bridge abutment wall. Fill the space around the conduit with mortar under section 51-1, except the proportion of cementitious material to sand must be 1 to 3. Fill the space around the conduits after prestressing is completed.

Mark the location of conduit ends with a 3-inch tall "Y" for all conduits installed in structures or terminating at curbs. Mark the "Y" on the face of a curb, gutter or wall, directly above the conduit, and above grade line.

87-1.03B(2)(c) Existing Structures

Run surface-mounted conduit straight and true, horizontal or vertical on the wall, and parallel to walls on ceilings or similar surfaces. Support the conduit at a maximum of 5-foot intervals where needed to prevent vibration or deflection. Support the conduit using galvanized, malleable-iron, conduit clamps, and clamp backs secured with expansion anchorage devices. Use the largest diameter of galvanized, threaded studs that will pass through the mounting hole in the conduit clamp.

87-1.03B(3) Conduit Installation Underground

87-1.03B(3)(a) General

Notify the Engineer at least 4 business days before starting horizontal directional drilling method or jack and drill method.

Install conduit to a depth of:

1. 18 inches, minimum, under sidewalk and curbed paved median areas
2. 42 inches, minimum, below the bottom of the rail of railroad tracks
3. 30 inches, minimum, everywhere else below grade

Install Type 1 or Type 2 conduit with explosion-proof sealing fittings, within the limits of hazardous locations as specified in NEC for Class I, division 1.

Install a minimum 1-1/2-inch diameter Type 1 or Type 2 conduit under railroad tracks.

You may lay conduit on existing pavement within a new curbed median constructed on top.

Install conduit under pavement by either the horizontal directional drilling method or jack and drill method.

Place conduit couplings at a minimum of 6 inches from the face of a foundation.

87-1.03B(3)(b) Conduit in Trenches

87-1.03B(3)(b)(i) General

Backfill trench with:

1. A minimum of 2 inches of sand bedding before installing the conduit
2. 18 inches of slurry concrete over the conduit
3. Native material over the slurry cement

Use slurry concrete under section 19-3.02E except, the size of the aggregate must be 3/8 inch or smaller.

Grade the trench surface to match the existing grade.

87-1.03B(3)(b)(ii) High Density Polyethylene Conduit Installation

For sweeps, maintain a conduit bend radius of a minimum 10 times the outside diameter of the conduit.

Conduits must not protrude more than 2 inches inside the pull box and vaults, and must enter at an angle less than 20 degrees from either the vertical or horizontal axis.

Demonstrate a minimum of 2 test fusions to the Engineer prior to performing fusion operations on HDPE conduit to be installed.

Join HDPE conduit using the electro fusion method recommended by the conduit manufacturer. Do not expose conduit to direct flame. The electro-fusion must be performed by a person certified by the conduit manufacturer.

Place warning tape in the trench 6 inches below finished grade.

Slurry concrete must be pigmented to match color no. 21105 of AMS-STD-595.

Blow out all conduits with compressed air until all foreign material is removed, before installing innerducts.

Install innerducts as one continuous unit between vaults. Innerducts may be interrupted inside pull boxes located between vaults and cabinets.

Lubricate innerducts per manufacturer's instructions during installation.

Seal the ends of conduit after cables or pull tape are installed.

87-1.03B(3)(b)(iii) Trench-In-Pavement Method

Install conduit using a trench approximately 2 inches wider than the outside diameter of the conduit but not exceeding 6 inches in width.

Dig the trench by hand to the required depth at pull boxes.

When work includes resurfacing the road:

1. Complete the trenching before the final pavement layer is applied
2. Backfill the trench with slurry cement up to the pavement's surface by the end of each workday

When work does not include resurfacing the road and the trench is in asphalt concrete pavement, backfill the:

1. Trench with slurry cement up to 2 inches below the pavement's surface by the end of each workday
2. Remaining top 2 inches with HMA Type A under Section 39-2, within 3 days after trenching. Clean the trench and apply a tack coat before placing the HMA

87-1.03B(3)(c) Horizontal Directional Drilling Method

Install a conduit to a minimum depth of 4 feet and maximum depth of 6 feet. If you must install a conduit less than 4 feet in depth or greater than 6 feet in depth, the installation must be authorized.

The diameter of the bore hole must be no larger than 1.5 times the outside diameter of the conduit.

Water-based mineral slurry or wetting solution may be used to lubricate the boring tool and stabilize the soil surrounding the boring path.

Dispose of residue per section 13-4.03D.

The horizontal directional drilling equipment must have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the equipment must be able to determine the location of the tool both horizontally and vertically.

Use a mandrel to prove the conduit is free and clear of dirt, rocks, and other debris after installation.

87-1.03B(3)(d) Jack and Drill Method

Keep the jacking or drilling pit 2 feet away from the edge of pavement except when installing conduit under rail-road tracks. Construct the jacking or drilling pit a minimum of 13 feet from the centerline of the track to the closest side of the pit. Do not weaken the pavement or soften the subgrade with excessive use of water.

Cover the jacking pit with planking if left overnight.

If an obstruction is encountered, obtain authorization to cut small holes in the pavement to locate or remove the obstruction.

You may install Type 2 or Type 3 conduit under the pavement if a hole larger than the conduit's diameter is predrilled. The predrilled hole must be less than one and half the conduit's diameter.

Remove the conduit used for drilling or jacking and install new conduit for the completed work.

Replace section 87-1.03C with:

10-18-19

87-1.03C Installation of Pull Boxes

87-1.03C(1) General

Install pull boxes no more than 200 feet apart.

Place the cover on the box when not working in it.

87-1.03C(2) Roadway Pull Boxes

87-1.03C(2)(a) General

You may install larger pull boxes than specified or shown and additional pull boxes to facilitate the work except in structures.

10-16-20

Where a roadway pull box is adjacent to a post or standard, place the pull box within 5 feet from the post or standard on the downstream side of traffic when practical.

10-18-19

Install a pull box on a minimum 6-inch deep bed of crushed rock and grout it before installing conductors. The grout must be from 0.5 to 1 inch thick and sloped toward the drain hole. Place a layer of roofing paper between the grout and the crushed rock sump. Make a 1-inch drain hole through the grout at the center of the pull box.

Set the pull box such that the top is 1-1/4 inches above the surrounding grade in unpaved areas and leveled with the finished grade in sidewalks and other paved areas.

Grout around conduits that are installed through the sides of the pull box.

Bond and ground the metallic conduit before installing conductors and cables in the conduit.

Bond metallic conduits in a nonmetallic pull box using bonding bushings and bonding jumpers.

Do not install pull boxes in concrete pads, curb ramps, or driveways.

Reconstruct the sump of a pull box if disturbed by your activities. If the sump was grouted, remove and replace the grout.

87-1.03C(2)(b) Nontraffic Pull Boxes

For a buried nontraffic pull box, install the electronic marker and set the box such that the top is from 6 to 8 inches below the surrounding grade. Place a 20-mil-thick plastic sheet made of HDPE or PVC virgin compounds to prevent water from entering the box.

When a pull box is in a structure, modify the base as required.

Place mortar between a nontraffic pull box and a pull box extension.

Where a nontraffic pull box is in the vicinity of a curb in an unpaved area, place the box adjacent to the back of the curb if practical.

If you replace the cover on a nontraffic pull box, anchor it to the box.

Perform the electronic marker test.

87-1.03C(2)(c) Traffic Pull Boxes

Place minor concrete around and under a traffic pull box as shown.

Bolt the steel cover to the box when not working in it.

Bond the steel cover to the conduit with a minimum 3-foot-long jumper and bolt it down after installing the conductors and cables.

87-1.03C(2)(d) Tamper-Resistant Pull Boxes

Install the tamper-resistant pull boxes under the manufacturer's instructions.

87-1.03C(3) Structure Pull Boxes

Install structure pull boxes parallel to the structure.

After removing the knockouts, flatten the surrounding area.

Bond conduit to a structure pull box using locknuts on the inside and outside of the box.

Cover pull boxes with a 1/4-inch plywood during pouring of PCC. For a no. 9 pull box, the upper edge of the plywood must fit against the lower edge of the rain tight hood.

Install no. 7 pull box with bottom flanges flush with the bottom of the box girder. Place top and bottom covers and seal the pull box during PCC pouring.

For no. 9 and 9A pull boxes:

1. Form a 1:1 chamfer around the cover
2. Use the drain hole in the center if the box is horizontal and the low end drain hole if the box is inclined
3. Mounted in a sloping parapet, drill a 1/2-inch elongated drain hole in the center if the box is horizontal or the low end if the box is inclined

Replace section 87-1.03D with:

10-16-20

87-1.03D Battery Backup System Cabinets

Install the battery backup system cabinet to the right side of the controller cabinet. If installation on the right side is not possible, obtain authorization for installation on the left side.

Construct access opening between controller cabinet and battery backup cabinet using:

1. 2-inch nylon-insulated, steel chase nipple
2. 2-inch steel sealing locknut
3. 2-inch nylon-insulated, steel bushing

Remove the jumper between the terminals labeled *BBS-1* and *UBS-1* and the jumper between the terminals labeled *BBS-2* and *UBS-2* in the 7-position terminal block in the controller cabinet before connecting the Department-furnished electronics assembly.

Install the electronics assembly and batteries in the battery backup system cabinet. Obtain authorization for installation of the electronics assembly in the controller cabinet.

Replace section 87-1.03E(2) with:

04-15-22

87-1.03E(2) Trenching

Do not trench until conduit or direct burial cables are on-site and ready for installation.

Place excavated material in a location that will not interfere with traffic or surface drainage.

Compact native material backfill to a minimum relative compaction of:

1. 95 percent when placed within the hinge points and in areas where pavement is to be constructed
2. 90 percent when placed outside the hinge points and not under pavement

Restore the sidewalks, pavement, and landscaping at a location before starting excavation at another location.

Replace section 87-1.03E(3) with:

10-15-21

87-1.03E(3) Concrete Pads, Foundations, and Pedestals

Construct concrete pads, foundations, and pedestals under section 56-3.

Construct a pad in front of a Type III service equipment enclosure. The pad must be 24 inches in length, 4 inches in thickness, and must match the width of the foundation.

In unpaved areas, place the top of the foundation 6 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. 2 inches above the grade for Type III service equipment enclosures

The pad must be 2 inches above the surrounding grade in unpaved areas.

In and adjacent to the sidewalk and other paved areas, place the top of the foundation 4 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. Level with the finished grade for Type III service equipment enclosures

The concrete pad must be level with the finished grade in paved areas.

Add between the 3rd and 4th paragraphs of section 87-1.03F(1):

04-17-20

Provide conductor and cable slack to comply with the requirements shown in the following table:

Conductor and Cable Slack Requirements

Location	Slack (feet)
Signal standard	1
Lighting standard	1
Signal and lighting standard	1
Pull box	3
Splice	3
Controller cabinet	6
Standards with slip base	0

Replace the last paragraph of section 87-1.03F(1) with:

04-19-19

Install a tracer wire.

Replace section 87-1.03F(2) with:

04-17-20

87-1.03F(2) Cables

87-1.03F(2)(a) General

Reserved

87-1.03F(2)(b) Communication Cables

87-1.03F(2)(b)(i) General

Terminate the ends of the communication cables as shown.

87-1.03F(2)(b)(ii) Category 5E and 6 Cables

Do not splice category 5E and 6 cables.

87-1.03F(2)(b)(iii) Telephone Cables

Do not splice telephone cables between the telephone demarcation point and the controller cabinet.

87-1.03F(2)(c) Copper Cables

87-1.03F(2)(c)(i) General

Reserved

87-1.03F(2)(c)(ii) Detector Lead-in Cables

Install a Type B or C detector lead-in cable in conduit.

Seal the ends of the lead-in cable before installing it in the conduit to prevent moisture from entering the cable.

Splice loop conductors for each direction of travel for the same phase, terminating in the same pull box, to a separate lead-in cable running from the pull box adjacent to the loop detector to a sensor unit mounted in the controller cabinet. Install the lead-in cable without splices except at the pull box when connecting to loop wire.

Verify in the presence of the Engineer that the loops are operational before making the final splices between loop conductors and the lead-in cable.

Identify and tag each lead-in cable with the detector designation at the cabinet and pull box adjacent to the loops.

87-1.03F(2)(c)(iii) Conductors Signal Cables

Do not splice signal cables except for a 28-conductor cable.

Provide identification at the ends of terminated conductors in a cable as shown.

Provide identification for each cable in each pull box showing the signal standard to which it is connected except for the 28-conductor cable.

Connect conductors in a 12-conductor cable as shown in the following table:

12CSC Color Code and Functional Connection

Color code	Termination	Phase
Red	Red signal	2, 4, 6, or 8
Yellow	Yellow signal	2, 4, 6, or 8
Brown	Green signal	2, 4, 6, or 8
Red/black stripe	Red signal	1, 3, 5, or 7
Yellow/black stripe	Yellow signal	1, 3, 5, or 7
Brown/black stripe	Green signal	1, 3, 5, or 7
Black/red stripe	Spare or as required for red or <i>DONT WALK</i>	--
Black/white stripe	Spare or as required for yellow	--
Black	Spare or as required for green or <i>WALK</i>	--
Red/white stripe	Pedestrian signal <i>DONT WALK</i>	--
Brown/white stripe	Pedestrian signal <i>WALK</i>	--
White	Terminal block	Neutral

Provide identification for each 28-conductor cable C1 or C2 in each pull box. The cable labeled C1 must be used for signal phases 1, 2, 3, and 4. The cable labeled C2 must be used for signal phases 5, 6, 7, and 8.

Connect conductors in a 28-conductor cable as shown in the following table:

28CSC Color Code and Functional Connection

Color code	Termination	Phase
Red/black stripe	Red signal	2 or 6
Yellow/black stripe	Yellow signal	2 or 6
Brown/black stripe	Green signal	2 or 6
Red/orange stripe	Red signal	4 or 8
Yellow/orange stripe	Yellow signal	4 or 8
Brown/orange stripe	Green signal	4 or 8
Red/silver stripe	Red signal	1 or 5
Yellow/silver stripe	Yellow signal	1 or 5
Brown/silver stripe	Green signal	1 or 5
Red/purple stripe	Red signal	3 or 7
Yellow/purple stripe	Yellow signal	3 or 7
Brown/purple stripe	Green signal	3 or 7
Red/2 black stripes	Pedestrian signal <i>DONT WALK</i>	2 or 6
Brown/2 black stripes	Pedestrian signal <i>WALK</i>	2 or 6
Red/2 orange stripes	Pedestrian signal <i>DONT WALK</i>	4 or 8
Brown/2 orange stripes	Pedestrian signal <i>WALK</i>	4 or 8
Red/2 silver stripes	Overlap A, C	OLA ^a , OLC ^a
Brown/2 silver stripes	Overlap A, C	OLA ^c , OLC ^c
Red/2 purple stripes	Overlap B, D	OLB ^a , OLD ^a
Brown/2 purple stripes	Overlap B, D	OLB ^c , OLD ^c
Blue/black stripe	Pedestrian push button	2 or 6
Blue/orange stripe	Pedestrian push button	4 or 8
Blue/silver stripe	Overlap A, C	OLA ^b , OLC ^b
Blue/purple stripe	Overlap B, D	OLB ^b , OLD ^b
White/black stripe	Pedestrian push button common	--
Black/red stripe	Spare	--
Black	Spare	--
White	Terminal block	Neutral

OL = Overlap; A, B, C, and D = Overlapping phase designation

^aFor red phase designation

^bFor yellow phase designation

^cFor green phase designation

Use the neutral conductor only with the phases associated with that cable. Do not intermix neutral conductors from different cables except at the signal controller.

87-1.03F(2)(c)(iv) Signal Interconnect Cable

Do not splice the cable unless authorized.

If splices are authorized, insulate the conductor splices with heat-shrink tubing and overlap the insulation at least 0.6 inch. Cover the splice area of the cable with heat-shrink tubing and overlap the cable jacket at least 1-1/2 inches. Provide a minimum of 3 feet of slack at each splice.

87-1.03F(2)(c)(v) Railroad Preemption Cables

Do not splice railroad preemption cable from controller cabinet to railroad cabinet.

Terminate individual conductors with ferrule connectors in the controller cabinet.

Provide identification on both ends of the cable and connect the cable end in the controller cabinet as shown in the following table:

Color Code and Functional Connection

Conductor no.	Color Code	Controller Cabinet Field Terminal Connections	Conductor Identification
1	Black	Not Used	Spare
2	White	Not Used	Spare
3	Red	FT8-A145	Health Status DC+
4	Green	Not Used	Spare
5	Orange	FT7-A134	Simultaneous DC-
6	Blue	FT7-A131	Advance DC-
7	White/black stripe	Not Used	Spare
8	Red/black stripe	FT8-A144	Gate Down/Island
9	Green/black stripe	Feld Terminal FT8-A142	Advance Pedestrian Preemption
10	Orange/black stripe	FT7-A135	Simultaneous Primary
11	Blue/black stripe	FT7-A132	Advance Primary
12	Black/white stripe	Not Used	Spare
13	Red/white stripe	FT8-A143	Gate Down/Island DC-
14	Green/white stripe	FT8-A141	Advance Pedestrian Preemption DC-
15	Blue/white stripe	FT7-A133	Advance Secondary
16	Black/red stripe	Not Used	Spare
17	White/red stripe	FT8-A146	Health Status DC-
18	Orange/red stripe	FT7-A136	Simultaneous Secondary

04-17-20

Keep all exposed conductors the same length and individually insulate spare conductors against each other.

Provide a minimum 6 feet of slack in the pull box adjacent to the railroad cabinet.

Connect the cable end in the railroad cabinet as directed by the railroad agency representative.

04-17-20

Delete the 4th paragraph of 87-1.03F(3)(a).

Replace the 1st paragraph of section 87-1.03F(3)(c)(ii) with:

10-19-18

Install a Type 1 or 2 inductive loop conductor except use Type 2 for Type E and F loop detectors.

10-19-18

Delete the last paragraph of section 87-1.03G.

Replace the 4th paragraph of section 87-1.03H(2) with:

10-19-18

Use Method B as follows:

1. Cover the splice area completely with an electrical insulating coating and allow it to dry.
2. Apply 3 layers of half-lapped, PVC electrical tape.
3. Apply 2 layers of butyl-rubber, stretchable tape with liner.
4. Apply 3 layers of half-lapped, PVC, pressure-sensitive, adhesive tape.
5. Cover the entire splice with an electrical insulating coating and allow it to dry.

Replace section 87-1.03N with:

10-19-18

87-1.03N Fused Splice Connectors

Install a fuse splice connector with a fuse in each ungrounded conductor for luminaires, except for overhead sign luminaires. The connector must be located in the pull box adjacent to the luminaires.

If the pull box for the roadway luminaire is tamper resistant, install a fuse splice connector with 10 A fuse in the pull box and an additional fuse splice connector with a 5 A fuse in the handhole.

Install a fuse splice connector with a fuse on primary side of transformer.

Crimp the connector terminals onto the ungrounded conductors using a tool under the manufacturer's instructions. Insulate the terminals and make them watertight.

Add between the 2nd and 3rd paragraphs of section 87-1.03P:

04-16-21

Apply a sealing compound between the foundation and the enclosure before installing the enclosure.

Replace section 87-1.03T with:

10-15-21

87-1.03T Accessible Pedestrian Signals

Install accessible pedestrian signals of the same manufacturer at each location.

Do not install APS components inside the controller cabinet.

Identify conductors on both ends of the signal interface cable. Label each conductor according to their function under the manufacturer's instructions.

Attach the accessible pedestrian signal to the standard with self-tapping screws. Drill a 1-inch diameter hole on the standard for the signal interface cable.

Install the 9 by 12 inches R10-3j (CA) sign using the adapter plate provided by the APS manufacturer.

Point the arrow on the accessible pedestrian signal in the crossing direction.

When using a push button assembly post, cut the post to 2 inches above the R10-3j (CA) sign.

Furnish the equipment and hardware to set up and calibrate the accessible pedestrian signal.

Arrange to have a manufacturer's representative at the job site to program the accessible pedestrian signal with an audible message or tone.

When replacing an existing accessible pedestrian signal, the enclosure color must match the color of the existing enclosure.

Add to the end of section 87-1.03U:

10-19-18

When replacing an existing push button assembly, the housing color must match the color of the existing housing.

04-17-20

Delete the 9th paragraph for section 87-1.03V(2).

Add between the 1st and 2nd paragraphs of section 87-1.03Y:

04-19-19

Use a submersible type transformer inside pull boxes.

Replace the 2nd paragraph of section 87-2.03A with:

10-19-18

Tighten the cap screws of the luminaire's clamping bracket to 10 ft-lb for roadway luminaires.

Replace section 87-3 with:

10-19-18

87-3 SIGN ILLUMINATION SYSTEMS

87-3.01 GENERAL

Section 87-3 includes specifications for constructing sign illumination systems.

Sign illumination system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Overhead sign luminaires
6. Service equipment enclosure
7. Photoelectric control

The components of a sign illumination system are shown on the project plans.

87-3.02 MATERIALS

Reserved

87-3.03 CONSTRUCTION

Perform the conductor test.

Install overhead sign luminaires under the manufacturer's instructions.

Do not modify the sign structure or mounting channels.

Perform the operational tests for the system.

87-3.04 PAYMENT

Not Used

Replace section 87-4 with:

04-17-20

87-4 SIGNAL AND LIGHTING SYSTEMS

87-4.01 GENERAL

Section 87-4 includes specifications for constructing signal and lighting systems.

Signal and lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Signal heads

7. Service equipment enclosure
8. Department-furnished controller assembly
9. Detectors
10. Telephone demarcation cabinet
11. Accessible pedestrian signals
12. Push button assemblies
13. Pedestrian signal heads
14. Luminaires
15. Photoelectric control
16. Fuse splice connectors
17. Battery backup system
18. Flashing beacons
19. Flashing beacon control assembly

The components of a signal and lighting system are shown on the project plans.

87-4.02 MATERIALS

87-4.02A General

Not used

87-4.02B Railroad Preemption

A wire jumper for railroad preemption must be:

1. Stranded
2. 14 AWG
3. White with red stripes

87-4.03 CONSTRUCTION

87-4.03A General

Set the foundation for a standard such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the roadway luminaire's clamping bracket to 10 ft-lb.

Label the month and year of the installation inside the luminaire housing's door.

Perform the conductor and operational tests for the system.

87-4.03B Railroad Preemption

Connect the C16 harness plug to the C16 socket on the Output File no. 2LX in the controller cabinet.

Connect the terminated conductors of the C16 harness to terminal block TB9 on input panel no.1 in the controller cabinet as shown in the following table:

Input Panel No. 1 Connections		
Pin	Label	TB9
1	J-12D	4
2	J-12J	5
3	J-13D	7
4	J-13J	8
5	J-14D	10
6	J-14J	11

Terminate wire jumpers with spade connectors on both ends.

Connect three wire jumpers approximately 4 feet in length as show in the following table:

Jumper Connections

Jumper	Bus	TB9
1	DC-	6
2	DC-	9
3	DC-	12

Connect three wire jumpers approximately 2 inches in length as show in the following table:

Jumper Connections

Jumper	Terminal Block	Pin	Pin
1	TB-12	5	7
2	TB-13	5	7
3	TB-14	5	7

87-4.04 PAYMENT

Not Used

Replace section 87-7.02 with:

10-19-18

87-7.02 MATERIALS

Flashing beacon control assembly includes:

1. Enclosure.
2. Barrier-type terminal blocks rated for 25 A, 600 V(ac), made of molded phenolic or nylon material and have plated-brass screw terminals and integral marking strips.
3. Solid state flasher complying with section 8 of NEMA standards publication no. TS 1 for 10 A, dual circuits.
4. 15-A, circuit breaker per ungrounded conductor.
5. Single-hole-mounting toggle type, single-pole, single-throw switches rated at 12-A, 120 V(ac). Switches must be furnished with an indicating nameplate reading *Auto - Test*. A 15-A circuit breaker may be used in place of the toggle switch.

Replace section 87-8 with:

10-16-20

87-8 PEDESTRIAN HYBRID BEACON SYSTEMS

87-8.01 GENERAL

87-8.01A Summary

Section 87-8 includes specifications for constructing pedestrian hybrid beacon system.

A pedestrian hybrid beacon system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Pedestrian hybrid beacon face
7. Pedestrian signal heads
8. Service equipment enclosure
9. Department-furnished controller assembly
10. Accessible pedestrian signals
11. Push button assemblies
12. Luminaires

- 13. Fuse splice connectors
- 14. Battery backup system

The components of a pedestrian hybrid beacon system are shown on the project plans.

87-8.01B Definitions

Reserved

87-8.01C Submittals

Reserved

87-8.01D Quality Assurance

87-8.01D(1) General

Reserved

87-8.01D(2) Quality Control

Verify the sequence for the pedestrian hybrid beacon system per California *MUTCD*, Chapter 4F, Figure 4F-3 "Sequence for a Pedestrian Hybrid Beacon" during the operational test.

Test the battery backup system.

87-8.02 MATERIALS

87-8.02A General

The pedestrian hybrid beacon system must comply with California *MUTCD*, Chapter 4F.

87-8.02B Pedestrian Hybrid Beacon Face

A pedestrian hybrid beacon face consists of two red indications on the top and one yellow indication on the bottom.

87-8.03 CONSTRUCTION

Install pedestrian hybrid beacon system under sections 87-4.03A.

Install battery backup system.

87-8.04 PAYMENT

Not Used

Replace the 1st paragraph of section 87-12.03 with:

Install changeable message sign on sign structure under section 56-2. 10-19-18

Add to the list in the 2nd paragraph of section 87-14.01A:

8. Signs 10-16-20

Replace section 87-14.02 with:

87-14.02 MATERIALS 10-19-18

87-14.02A General

Vehicle speed feedback sign consists of a housing, display window, and radar unit.

Sign must:

- 1. Comply with the California *MUTCD*, Chapter 2B

2. Have an operating voltage of 120 V(ac) for permanent installations
3. Have a maximum weight of 45 lb
4. Have a wind load rating of 90 mph
5. Have an operating temperature range from -34 to 165 degrees F
6. Have a retroreflective white sheeting background

87-14.02B Housings

Housing must:

1. Be weatherproof (NEMA 3R or better) and vandal resistant
2. Be made of 0.09-inch-gauge welded aluminum with the outer surfaces being UV resistant
3. Have the manufacturer's name, model number, serial number, date of manufacture, rated voltage and rated current marked inside
4. Have the internal components easily accessible for field repair without removal of the sign

87-14.02C Display Windows

Display window consists of a cover, LED character display, and dimming control. Character display and cover must deflect together without damage to the internal electronics and speed detection components.

Cover must be:

1. Vandal resistant and shock absorbent
2. Field replaceable with the removal of external stainless-steel, tamper proof fasteners

Cover must be made of a minimum 0.25-inch-thick, shatter-resistant polycarbonate.

LED character display must:

1. Consist of two 7-segment, solid-state, numeric characters, which must:
 - 1.1. Be a minimum:
 - 1.1.1. 18 inches in height for freeways and expressways
 - 1.1.2. 14 inches in height for conventional highways
 - 1.2. Have a width-to-height ratio between 0.7 and 1.0
 - 1.3. Have a stroke width-to-height ratio of 0.2
 - 1.4. Be visible from a minimum distance of 1500 feet and legible from a minimum distance of 750 feet
 - 1.5. Consist of a minimum 16 LEDs, which must:
 - 1.5.1. Be amber and have a wavelength from 590 to 600 nm and rated for minimum 60,000 hours
 - 1.5.2. Maintain a minimum 85 percent of the initial light output after 48 months of continuous use over the temperature range
- 10-16-20
2. Be capable of displaying the detected vehicle speed within 1 second
 3. Remain blank when no vehicles are detected within the radar detection zone
 4. Have the option to flash the pre-set speed limit when the detected vehicle speed is 5 miles higher than the pre-set speed
 5. Be viewable only by the approaching traffic
- 10-19-18

Dimming control must:

1. Automatically adjust the character light intensity to provide optimum character visibility and legibility under all ambient lighting conditions
2. Have minimum 3 manual dimming modes of different intensities

87-14.02D Radar Units

Radar unit must:

1. Be able to detect up to 3 lanes of approaching traffic
2. Operate with an internal, low power, 24.159 GHz (K-band)

3. Be FCC approved Part 15 certified
4. Have a speed accuracy of ± 1 mph
5. Have a maximum 15 W power consumption

Add between the 1st and 2nd paragraphs of section 87-14.03:

Install R2-1 SPEED LIMIT sign.

10-16-20

Add to the list in the 2nd paragraph of section 87-18.01:

4. 12 position terminal block

10-18-19

Replace section 87-18.02 with:

87-18.02 MATERIALS

Terminal block must comply with TEES, chapter 1, section 3.

10-18-19

Replace the 2nd paragraph of section 87-18.03 with:

Install the terminal block on the input panel in the controller cabinet.

Connect the signal interconnect cable to the terminal block as shown in the following table:

10-18-19

Signal Interconnect Termination

Terminal Block	Color
1	BLUE
2	BLACK
3	RED
4	BLACK
5	BROWN
6	BLACK
7	GREEN
8	BLACK
9	YELLOW
10	BLACK
11	WHITE
12	BLACK

Replace 87-19 with:

10-19-18

87-19 FIBER OPTIC CABLE SYSTEMS

87-19.01 GENERAL

87-19.01A Summary

Section 87-19 includes specifications for constructing fiber optic cable systems.

A fiber optic cable system includes:

1. Conduit and accessories

2. Vaults
3. Warning tape
4. Fiber optic cables
5. Fiber optic splice enclosures
6. Fiber distribution units
7. Fiber optic markers
8. Fiber optic connectors and couplers

The components of a fiber optic system are shown on the project plans.

87-19.01B Definitions

Reserved

87-19.01C Submittals

At least 15 days before cable installation, submit:

1. Manufacturer's procedures for pulling fiber optic cable
2. Test reports from a laboratory accredited to International Standards Organization/International Electrotechnical Commission 17025 by the American Association for Laboratory Accreditation (A2LA) or the ANSI-ASQ National Accreditation Board (ANAB) for:
 - 2.1. Water penetration
 - 2.2. Cable temperature cycling
 - 2.3. Cable impact
 - 2.4. Cable tensile loading and fiber strain
 - 2.5. Cable compressive loading
 - 2.6. Compound flow
 - 2.7. Cyclic flexing
3. Proof of calibration for the test equipment including:
 - 3.1. Name of calibration facility
 - 3.2. Date of calibration
 - 3.3. Type of equipment, model number and serial number
 - 3.4. Calibration result

Submit optical time-domain reflectometer data files for each test in a Microsoft Excel format.

After performing the optical time-domain reflectometer test and the power meter and light source test, submit within 4 business days a hard copy and electronic format:

1. Cable Verification Worksheet
2. Segment Verification Worksheet
3. Link Loss Budget Worksheet

The worksheets are available at the Division of Construction website.

87-19.01D Quality Assurance

87-19.01D(1) General

Reserved

87-19.01D(2) Quality Control

Notify the Engineer 4 business days before performing field tests. Include exact location of the system or components to be tested. Do not proceed with the testing until authorized. Perform each test in the presence of the Engineer.

The optical time-domain reflectometer test consists of:

1. Inspecting the cable segment for physical damage.
2. Measuring the attenuation levels for wavelengths of 1310 and 1550 nm in both directions for each fiber using the optical time-domain reflectometer.
3. Comparing the test results with the data sheet provided with the shipment. If there are attenuation deviations greater than 5 percent, the test will be considered unsatisfactory and the cable segment

will be rejected. The failure of any single fiber is a cause for rejection of the entire segment. Replace any rejected cable segments and repeat the test.

The power meter and light source test consists of:

1. Testing each fiber in a link using a light source at one end of the link and a power meter at the other end
2. Measuring and recording the power loss for wavelengths of 1310 and 1550 nm in both directions

Index matching gel is not allowed.

Installation and splicing of the fiber optic cable system must be performed by a certified fiber optic installer.

The optical time-domain reflectometer test and the power meter and light source test must be performed by a certified fiber optic technician.

The certification for the fiber optic installer and fiber optic technician must be from an organization recognized by the International Certification Accreditations Council and must be current throughout the duration of the project.

87-19.02 MATERIALS

87-19.02A General

All metal components of the fiber optic cable system must be corrosion resistant.

All connectors must be factory-installed and tested.

Patch cords, pigtails, and connectors must comply with ANSI/TIA-568.

Pigtails must have a minimum 80 N pull out strength.

A splice cassette may be used in place of a pigtail and a splice tray.

Each cable reel must have a weatherproof label or tag with information specified in ANSI/ICEA S-87-640 including:

1. Contractor's name
2. Contract number
3. Number of fibers
4. Cable attenuation loss per fiber at 1310 and 1550 nm

The labeled or tagged information must also be in a shipping record in a weatherproof envelope. The envelope must be removed only by the Engineer.

87-19.02B Vaults

A vault must:

1. Comply with section 86-1.02C and AASHTO HS 20-44, and load tested under AASHTO M 306.
2. Be a minimum:
 - 2.1. 4 feet wide by 4 feet high by 4 feet long nominal inside dimensions for box type.
 - 2.2. 4 feet high by 4 feet outside diameter for round type.
3. Have a minimum access of:
 - 3.1. 30 inches diameter for round type.
 - 3.2. 3 feet wide by 3 feet long for box type.
4. Be precast either modular or monolithic.
5. Have cable racks installed on the interior sides. A rack must:
 - 5.1. Be fabricated from ASTM A36 steel plate.
 - 5.2. Support a minimum of 100 pounds per rack arm.
 - 5.3. Support a minimum of 4 splice enclosures and a minimum of 4 cables with a minimum slack of 50 feet each.
 - 5.4. Be hot-dip galvanized after manufacturing.
 - 5.5. Be bonded and grounded.

6. Have a minimum:
 - 6.1. Two 4-inch diameter knockouts on each side for box type.
 - 6.2. Two 4-inch diameter knockouts placed every 90 degrees for round type.
7. Have a minimum 2-inch-diameter drain hole at the center of base.

Entry points for knockouts must not cause the cable to exceed its maximum bend radius.

The access cover must:

1. Be a two-piece torsion-assisted sections or a minimum 30-inch-diameter cast iron.
2. Have inset lifting pull slots.
3. Have markings *CALTRANS* and *FIBER OPTIC*.

87-19.02C Fiber Optic Cable

The fiber optic cable must:

1. Comply with 7 CFR parts 1755.900, 1755.901, and 1755.902, and ANSI/ICEA S-87-640
2. Be a singlemode, zero-dispersion, and have non-gel loose type buffer tubes
3. Have no splices
4. Have a Type H or Type M outer jacket
5. Be shipped on a reel
6. Have 10 feet of length on each end of the cable accessible for testing

87-19.02D Fiber Optic Splice Enclosures

A fiber optic splice enclosure must:

1. Not exceed 36 inches in length, 8 inches in width, and 8 inches in height
2. Be made of thermoplastic material, weather proof, chemical and UV resistant, and re-sealable
3. Accommodate a minimum of 8 internal splice trays
4. Have from 1/4 to 1 inch in diameter cable entry ports
5. Have brackets, clips and cable ties
6. Have means to anchor the dielectric member of the fiber optic cable
7. Include grounding hardware

87-19.02E Fiber Distribution Units

The fiber distribution unit consists of a housing, a patch panel, a 12-multicolor pigtail, and a splice tray.

The fiber distribution unit must be self-contained and pre-assembled.

The housing must:

1. Be a 19-inch rack-mountable modular-metal enclosure
2. Be a one rack unit
3. Have cable clamps to secure buffer tube to the chassis
4. Have cable accesses with rubber grommets or similar material to prevent the cable from coming in contact with the bare metal
5. Be weatherproof
6. Have a hinged top door with a latch or thumbscrew to hold it in the closed position

A patch panel must have a minimum of 12-singlefiber type connector sleeves.

A pigtail must:

1. Be a simplex single mode fiber in a 900 μm tight buffer with a 12-inch-outer-diameter PVC jacket
2. Have a fiber optic connector attached on one end and bare fiber on the other end
3. Be at least 3 feet in length
4. Have the manufacturer's part number on the jacket

Pigtails must be single-fiber or ribbon type.

87-19.02F Patch Cords

Patch cords must:

1. Be a singlemode fiber in a 900 μm tight buffer with a 0.12-inch-outer-diameter PVC jacket
2. Have fiber optic connectors attached on both ends
3. Be at least 6 feet in length
4. Have manufacturer's part number on the jacket

Duplex patch cords must be of round cable structure, and not have zip-cord structure.

87-19.02G Splice Trays

Splice trays must:

1. Have brackets to spool incoming fibers a minimum of 2 turns.
2. Have means to secure and protect incoming buffer tubes, pigtails, and a minimum of 12 heat shrink fusion splices.
3. Be stackable.
4. Have a snap-on or hinged cover. The cover may be transparent.

87-19.02H Fiber Optic Markers

Fiber optic markers must be:

1. Type K-2 (CA) object markers for vaults or pull boxes.
2. Disk markers for paved areas and transition points from unpaved to paved areas. The disk marker must be metallic, lead free and 4 inches in diameter, and must have a mounting stem at the center of the disk. The mounting stem must be a minimum 3 inches long and a minimum 0.70 inch in diameter.
3. Non-reflective Class 1, Type F, flexible post delineators for unpaved areas.

87-19.02I Fiber Optic Connectors and Couplers

Connectors must be:

1. 0.1-inch ceramic ferrule pre-radiused type
2. Capped when not used

Couplers must be made of the same material as the connector's housing and have ceramic sleeves.

Singlemode fiber optic connectors must have a yellow strain relief boot or a yellow base.

87-19.03 CONSTRUCTION

87-19.03A General

Perform the optical time-domain reflectometer test:

1. On the fiber optic cable upon its arrival to the job site and before its installation. Complete the Cable Verification Worksheet. Do not install the fiber optic cable until the Engineer's written approval is received.
2. After the fiber optic cable segments have been pulled, but before breakout and termination. Complete the Segment Verification Worksheet.
3. Once the passive cabling system has been installed and is ready for activation. If the measured individual fusion splice losses exceed -0.30 dB, re-splice and retest. At the conclusion of the optical time-domain reflectometer test, perform the power meter and light source test. If the measured link loss exceeds the calculated link loss, replace the unsatisfactory cable segments or splices and retest. Complete the Link Loss Budget Worksheet.

87-19.03B Vaults Installation

Install a vault as shown and with the side facing the roadway a minimum of 2 feet from the edge of pavement or back of dike, away from traffic.

Install the top of the vault flush with surrounding grade in paved areas and 2 inches above the surrounding grade in unpaved areas.

Place 6 inches of minor concrete around vaults. In unpaved areas, finish top of concrete at a 2 percent slope away from cover. In paved areas, finish top of concrete to match existing slope.

Bolt the steel cover to the vault when not working in it.

87-19.03C Fiber Optic Cable Installation

Install fiber optic cable by a certified installer or a representative from the fiber optic cable manufacturer during installation.

When using mechanical aids to install fiber optic cable:

1. Maintain a cable bend radius at least twenty times the outside diameter of the cable
2. Use cable grips having a ball bearing swivel
3. Use a pulling force on a cable not to exceed 500 pound-foot or manufacturer's recommended pulling tension, whichever is less

When installing the cable using the air blown method, the cable must withstand a static air pressure of 110 psi.

Lubricate the cable using a lubricant recommended by the cable manufacturer.

Install fiber optic cable without splices except where shown.

Provide a minimum of 65 feet of slack for each fiber optic cable at each vault. Divide the slack equally on each side of the splice enclosure.

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Install tracer wires in the fiber optic conduits and innerducts as shown. Provide a minimum 3 feet of slack tracer wire in each pull box and splice vault from each direction. You may splice tracer wire at intervals of not less than 500 feet and only inside splice vaults or pull boxes.

10-19-18

If a fiber optic cable and tracer wire is installed in an innerduct, pulling a separate fiber optic cable into a spare duct to replace damaged fiber will not be allowed.

Apply a non-hygroscopic filling compound to fiber optic cable openings.

Seal the ends of conduit and innerducts after cables are installed.

Install strain relief for fiber optic cable entering a fiber optic enclosure.

Identify fibers and cables by direct labeling, metal tags, or bands fastened in such a way that they will not move. Use mechanical methods for labeling.

Provide identification on each fiber optic cable or each group of fiber optic cables in each vault and at the end of terminated fibers. Fiber optic cable must be identified as shown in the following table:

Cable Identification^a

Sequence order	Description	Code	Numbers of characters
1	Fiber type	S: Singlemode	1
2	Fiber count	###: Example 048	3
3	Begin point	T: TMC H: Hub V: Video Node D: Data Node C: Cable Node TV: Camera CM: CMS E: Traffic Signal RM: Ramp Meter TM: Traffic Monitoring/ Count Station/Vehicle Count Station (VDS, TMS) HA: Highway Advisory Radio EM: Extinguishable Message Sign RW: Roadway Weather Information System WM: Weigh In Motion WS: Weigh-Station Bypass System SV: Vault SC: Splice Cabinet	1 or 2
4	Begin point county abbreviation	AA or AAA: Examples: Orange (ORA), San Mateo (SM)	2 or 3
5	Begin point route number	###: Examples: 005, 082, 114	3
6	Begin point post mile	#####: 02470 (example 024.70): Actual PM value to the 1/100 value	5
7	End Point	In the same way as for Begin Point	1 or 2
8	End point county abbreviation	In the same way as for Begin Point County Abbreviation	2 or 3
9	End point route number	In the same way as Begin Point Route Number	3
10	End point post mile	In the same way as Begin Point Post Mile	5

^aCable identification example: The cable code S 048 SV SM 084 02470 SV SC 082 02510 describes a singlemode, 48 strand, cable starting at a fiber optic vault in San Mateo County on Route 84 at post mile 24.70, and ending at another fiber optic vault in Santa Clara County on Route 82 at post mile 25.10.

Place labels on the cables at the following points:

1. Fiber optic vault and pull box entrances and exits
2. Splice enclosures entrance and exit
3. Fiber distribution unit entrance

Lace fiber optic cable inside controller cabinets and secure to the cage.

Support the fiber optic cable within 6 inches from a termination and every 2 feet.

Secure fiber optic cables to the cable racks. Store excess cable in a figure 8 fashion.

87-19.03D Fiber Optic Cable Splices

Use fusion splicing for fiber optic cables.

Splice single-buffer tube cable to multi-buffer tube cable using the mid-span access method under manufacturer's instructions. Any mid-span access splice or fiber distribution unit termination must involve only those fibers being spliced as shown.

Place fiber splices in the splice enclosures installed in the vaults.

87-19.03E Splice Enclosures Installation

Maintain an equal amount of slack on each side of the splice enclosure.

Secure the fiber optic splices in splice tray.

Secure the splice trays to the inner enclosure.

Label cables and buffer tubes.

Do not seal fiber splice enclosure until authorized and the power meter and light source test is performed. Seal the enclosure under manufacturer's instructions.

Flash test the outer enclosure under manufacturer's instructions in the presence of the Engineer. Visually inspect the enclosure. If bubbles are present, identify the locations where the bubbles are present, take corrective actions and repeat the flash test until no bubbles are present.

Attach the splice enclosure to the side wall of a vault or hub with a minimum 2 feet distance between the ground and the bottom of the enclosure.

Secure fiber optic cables to the chassis using cable clamps for fiber optic units.

Connect a minimum of one bonding conductor to a grounding electrode after mounting the fiber optic enclosure to the wall. If there are multiple bonding conductors, organize the conductors in a neat way.

87-19.03F Fiber Optic Distribution Unit Installation

Spool incoming buffer tubes 2 feet in the splice tray and expose 1 foot of individual fibers.

Maintain a minimum 2-inch-bend radius during and after installation in the splice tray.

Splice incoming fibers in the splice tray.

Restrain each fiber in the splice tray. Do not apply stress on the fiber when located in its final position.

Secure buffer tubes near the entrance of the splice tray.

Secure splice trays under manufacturer's instructions.

Label splice tray after splicing is completed.

Install patch cords in fiber distribution units and patch panels. Permanently label each cord and each connector in the panel with the system as shown.

87-19.03G Fiber Optic Markers Installation

Install fiber optic markers at 12-inch offset on the side furthest away from the edge of travel way:

1. For fiber optic cable at 500 feet apart in areas where the distance between vaults or pull boxes is greater than 500 feet
2. Adjacent to vaults and pull boxes
3. For fiber optic cable turns at:
 - 3.1. Beginning of the turn
 - 3.2. Middle of the arc
 - 3.3. End of the turn

When a fiber optic cable crosses a roadway or ramp, install a disk marker over the conduit trench on:

1. Every shoulder within 6 inches from the edge of pavement

2. Delineated median
3. Each side of a barrier

Install markers under section 81 except each retroreflective face must be parallel to the road centerline and facing away from traffic.

87-19.04 PAYMENT

Not Used

Replace section 87-20 with:

04-17-20

87-20 TEMPORARY ELECTRICAL SYSTEMS

87-20.01 GENERAL

Section 87-20 includes specifications for providing, maintaining, and removing temporary electrical systems.

Temporary systems may be mounted on wood posts or trailers.

Obtain the Department's authorization for the type of temporary electrical system and its installation method.

A temporary system must operate on a continuous, 24-hour basis.

A temporary electrical system must have a primary power source and a back-up power source from:

1. Commercial utility company
2. Generator system
3. Photovoltaic system

87-20.02 MATERIALS

87-20.02A General

Temporary wood poles must comply with section 48-6.

The components of a temporary system are shown on the project plans.

If you use Type UF-B cable, the minimum conductor size must be no. 12.

A back-up power source must:

1. Have an automatic transfer switch
2. Start automatically and transfer the system load upon reaching the operating voltage in the event of a power source failure

A trailer must be equipped with devices to level and plumb the temporary system.

87-20.02B Generators

A generator must:

1. Be 120 V(ac) or 120/240 V(ac), 60 Hz, 2.5 kW minimum, continuous-duty type
2. Be powered by a gasoline, LPG, or diesel engine operating at approximately 1,800 rpm with an automatic oil feed
3. Be equipped to provide automatic start-stop operation with a 12 V starting system
4. Have generator output circuits that have overcurrent protection with a maximum setting of 15 A
5. Have a spark arrester complying with Pub Cont Code § 4442

87-20.02C Automatic Transfer Switches

An automatic transfer switch must provide:

1. Line voltage monitoring in the event of a power outage that signals the back-up power source to start

2. Start delay, adjustable from 0 to 6 seconds, to prevent starting if the power outage is only momentary and a stop delay, adjustable from 0 to 8 minutes, to allow the back-up power source to unload
3. Transfer delay from 0 to 120 seconds to allow the back-up power source to stabilize before connecting to the load and retransfer delay from 0 to 32 minutes to allow the line voltage to stabilize
4. Mechanical interlock to prevent an application of power to the load from both sources and to prevent backfeeding from the back-up power source to the primary power source

87-20.02D–87-20.02G Reserved

87-20.02H Temporary Flashing Beacon Systems

A temporary flashing beacon system consists of a flashing beacon system, wood pole, and a power source.

The system must comply with the specifications for flashing beacon systems in section 87-7.

87-20.02I Temporary Lighting Systems

A temporary lighting system consists of a lighting system, a power source, and wood poles.

The system must comply with the specifications for lighting systems in section 87-2.

87-20.02J Temporary Signal Systems

A temporary signal system consists of a signal and lighting system, wood poles and posts, and a power source.

The system must comply with the specifications for signal and lighting systems in section 87-4, except signal heads may be mounted on a wood pole, mast arm, tether wire, or a trailer.

87-20.02K Temporary Radar Speed Feedback Sign Systems

A temporary radar speed feedback sign system must comply with the specifications for a radar speed feedback sign system in section 87-14, except, the LED character display must remain blank when no vehicles are detected or when the detected vehicle speed is 10 miles less than the preset speed.

87-20.03 CONSTRUCTION

10-15-21

87-20.03A General

Provide power and telecommunication services for temporary systems. Do not use existing services unless authorized.

Commercial power must be 120 V(ac) or 120/240 V(ac) single phase. Make arrangements with the utility company for providing service. Protect the power source in a locked enclosure. Provide keys for all locks to the Engineer.

You may install conductors and cables:

1. In a conduit
2. Suspended from wood poles at least 25 feet above the roadway
3. Suitable for direct burial

Install conduit outside the paved area at a minimum of 12 inches below grade for Type 1 and 2 conduit and at a minimum of 18 inches below grade for Type 3 conduit.

Install direct burial conductors and cables outside the paved area at a minimum depth of 24 inches below grade.

Install conductors and cables in Type 1, 2, or 3 conduit when mounted on wood poles to a height of 10 feet above the grade.

Place conductors across structures in a Type 1, 2, or 3 conduit. Attach the conduit to the outside face of the structure.

Mount the photoelectric unit at the top of the standard or wood post.

You may abandon:

DIVISION XI MATERIALS

90 CONCRETE

04-15-22

Add to section 90-1.01B:

10-18-19

CIP structural concrete members: CIP components of bridge structures, piling, retaining walls, sound walls, box culverts, drainage inlets, approach slabs, bridge railing, and bridge barriers.

Replace section 90-1.01C(6) with:

10-18-19

90-1.01C(6) Mix Design

90-1.01C(6)(a) General

Submit the concrete mix design before using the concrete in the work and before changing the mix proportions or an aggregate source.

90-1.01C(6)(b) Cast-In-Place Structural Concrete Members

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For CIP structural concrete members, submit with your mix design results from the tests specified in 90-1.01D(10)(b)(iv) and the results from the tests shown in the following table:

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Quality characteristic	Test method
Specific gravity and absorption of coarse aggregate	ASTM C127
Specific gravity and absorption of fine aggregate	ASTM C128
Durability index for fine aggregate	California Test 229
Soundness	California Test 214
Resistance to degradation	ASTM C131
Organic impurities	California Test 213
Chloride concentration of water for washing aggregates and mixing concrete	California Test 422
Sulfate concentration of water for washing aggregates and mixing concrete	California Test 417
Impurities in water for washing aggregates and mixing concrete	ASTM C191 or ASTM C266 and ASTM C109

Replace section 90-1.01C(8) with:

10-18-19

90-1.01C(8) Testing

90-1.01C(8)(a) General

If the concrete is tested for shrinkage, submit the test data with the mix design.

If prequalification is specified, submit certified test data or trial batch test reports under section 90-1.01D(5)(b).

If 56 days are allowed for the concrete to attain the compressive strength described, submit test results under section 90-1.01D(5)(a).

90-1.01C(8)(b) Cast-In-Place Structural Concrete Members

For CIP structural concrete members, submit test results within 3 business days after completing each QC test. For submittal of test results, go to:

<http://dime.dot.ca.gov/>

For CIP structural concrete members, include the following with the test results:

1. Contract number
2. Mix design number
3. Test sample identification number
4. Date and time of test
5. Batch plant
6. Batch number
7. Bridge number and description of element
8. Supporting data and calculations
9. Name, certification number, and signature of the QC tester

If additional compressive strength test results are needed for CIP structural concrete members to facilitate your schedule, submit a plot of the strength projection curve.

Add to the end of section 90-1.01C:

10-18-19

90-1.01C(11) Quality Control Plan for Cast-In-Place Structural Concrete Members

Section 90-1.01C(11) applies to CIP structural concrete members.

Submit 3 copies of the QC plan for review.

Submit an amended QC plan or an addendum to the QC plan when there are any changes to:

1. Concrete plants
2. Testing laboratories
3. Plant certification or laboratory accreditation status
4. Tester or inspector qualification status
5. QC personnel
6. Procedures and equipment
7. Material sources
8. Material testing

Allow the Department 5 business days to review an amended QC plan or an addendum to the QC plan.

90-1.01C(12) Concrete Materials Quality Control Summary Report for Cast-In-Place Structural Concrete Members

Section 90-1.01C(12) applies to CIP structural concrete members.

During concrete production for CIP structural concrete members, submit a concrete materials QC summary report at least once a month. The report must include:

1. Inspection reports.
2. Test results.
3. Documentation of:
 - 3.1. Test result evaluation by the QC manager
 - 3.2. Any discovered problems or deficiencies and the corrective actions taken
 - 3.3. Any testing of repair work performed
 - 3.4. Any deviations from the specifications or regular practices with explanation

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4. Certificate of compliance for the structural concrete material signed by the QC manager. The certificate must state that the information contained in the report is accurate, the minimum testing frequencies specified in section 90-1.01D(10)(b)(iv) are met, and the materials comply with the Contract.

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90-1.01C(13) Polymer Fibers

For concrete used in concrete bridge decks or PCC deck overlays, submit:

1. Fiber manufacturer's product data and application instructions
2. Certificate of compliance for each shipment and type of fiber

Replace the 3rd paragraph of section 90-1.01D(5)(a) with:

10-18-19

If the concrete is designated by compressive strength, the strength of concrete that is not steam cured is determined from cylinders cured under Method 1 of California Test 540.

Replace the 9th paragraph of section 90-1.01D(5)(a) with:

04-16-21

A compressive strength test represents no more than 300 cu yd of concrete and consists of the average compressive strength of two 6-by-12-inch cylinders or three 4-by-8-inch cylinders made from material taken from a single load of concrete. If a cylinder shows evidence of improper sampling, molding, handling, or testing, the cylinder is discarded and the test consists of the compressive strength of the remaining cylinders.

Add to the end of section 90-1.01D:

10-18-19

90-1.01D(7) Qualifications for Cast-In-Place Structural Concrete Members

Section 90-1.01D(7) applies to CIP structural concrete members.

QC laboratory testing personnel must have an ACI Concrete Laboratory Testing Technician, Level 1 certification or an ACI Aggregate Testing Technician, Level 2 certification, whichever certification includes the test being performed.

QC field testing personnel and field and plant inspection personnel must have an ACI Concrete Field Testing Technician, Grade I certification.

90-1.01D(8) Certifications for Cast-In-Place Structural Concrete Members

04-16-21

Each concrete plant used for CIP structural concrete members must have a current authorization under the Department's *MPQP*.

10-18-19

Each QC testing laboratory must be an authorized laboratory with current accreditation from the AASHTO Accreditation Program for the tests performed.

90-1.01D(9) Preconstruction Meeting for Cast-In-Place Structural Concrete Members

Section 90-1.01D(9) applies to CIP structural concrete members.

Before concrete placement, hold a meeting to discuss the requirements for structural concrete QC. The meeting attendees must include the Engineer, the QC manager, and at least 1 representative from each concrete plant performing CIP structural concrete activities for the Contract.

90-1.01D(10) Quality Control

90-1.01D(10)(a) General

Reserved

90-1.01D(10)(b) Cast-In-Place Structural Concrete Members

90-1.01D(10)(b)(i) General

Section 90-1.01D(10)(b) applies to CIP structural concrete members.

Develop, implement, and maintain a QC program that includes inspection, sampling, and testing of structural concrete materials for CIP structural concrete members.

Perform all sampling, testing, and inspecting required to control the process and to demonstrate compliance with the Contract and the authorized QC plan.

Provide a QC field inspector at the concrete delivery point while placement activities are in progress.

Provide a testing laboratory and the testing personnel for QC testing.

The QC inspector and the QC manager must be fully authorized by the Contractor to reject material.

QC testers and inspectors must be your employees or must be hired by a subcontractor providing only QC services. QC testers and inspectors must not be employed or compensated by a subcontractor or by other persons or entities hired by subcontractors who will provide other services or materials for the project.

If lightweight concrete, RSC, or SCC is used as structural concrete, you must also comply with the sampling and testing specifications of that section.

90-1.01D(10)(b)(ii) Quality Control Plan

The QC plan must detail the methods used to ensure the quality of the work and provide the controls to produce concrete. The QC plan must include:

1. Names and documentation of certification or accreditation of the concrete plants and testing laboratories to be used
2. Names, qualifications, and copies of certifications for the QC manager and all QC testing and inspection personnel to be used
3. Organization chart showing QC personnel and their assigned QC responsibilities
4. Example forms, including forms for certificates of compliance, hard copy test result submittals, and inspection reports
5. Methods and frequencies for performing QC procedures, including inspections and material testing
6. Procedures to control quality characteristics, including standard procedures to address properties outside of the specified operating range or limits, and example reports to document nonconformances and corrective actions taken
7. Procedures for verifying:
 - 7.1. Materials are properly stored during concrete batching operations
 - 7.2. Batch plants have the ability to maintain the concrete consistency during periods of extreme heat and cold
 - 7.3. Admixture dispensers deliver the correct dosage within the accuracy requirements specified
 - 7.4. Delivery trucks have a valid National Ready Mixed Concrete Association certification card
8. Procedures for verifying that the weighmaster certificate for each load of concrete shows:
 - 8.1. Concrete as batched complies with the authorized concrete mix design weights
 - 8.2. Moisture corrections are being accurately applied to the aggregates
 - 8.3. Cementitious materials are from authorized sources
 - 8.4. Any water that is added after batching at the plant
9. Procedures for visually inspecting the concrete during discharge operations

Allow the Department 5 business days to review an amended QC plan or an addendum to the QC plan.

90-1.01D(10)(b)(iii) Quality Control Manager

Assign a QC manager. The QC manager must have one of the following qualifications:

1. Civil engineering license in the State
2. ACI Concrete Laboratory Testing Technician, Level 1 certification
3. NICET Level II concrete certification
4. ICC Reinforced Concrete Special Inspector certification
5. ASQ Certified Manager of Quality/Organizational Excellence with the qualifying 10 years of experience and body of knowledge in the field of concrete

During concrete placement, the QC manager must be at the plant or job site within 3 hours of receiving notification from the Engineer.

90-1.01D(10)(b)(iv) Quality Control Testing Frequencies

For each mix design used to produce CIP structural concrete, perform sampling and testing in compliance with the following tables:

Aggregate QC Tests

Quality characteristic	Test method	Minimum testing frequency
Aggregate gradation	California Test 202	Once per each day of pour
Sand equivalent	California Test 217	
Cleanness value	California Test 227	
Moisture content of fine aggregate	California Test 226	1–2 times per each day of pour, depending on conditions

Concrete QC Tests

Quality characteristic	Test method	Minimum testing frequency
Slump	ASTM C143/C143M	Once per 100 cu yd or each day of pour, whichever is more frequent, and when requested by the Engineer
Uniformity ^a	ASTM C143/C143M, California Test 533, and California Test 529	When ordered by the Engineer
Air content, (freeze-thaw area)	California Test 504 ^b	If concrete is air entrained, once per 30 cu yd or each day of pour, whichever is more frequent
Air content, (non-freeze-thaw area)	California Test 504 ^b	If concrete is air entrained, once per 100 cu yd or each day of pour, whichever is more frequent
Temperature	California Test 557	Once per 100 cu yd or each day of pour, whichever is more frequent
Density	California Test 518	
Compressive strength ^{c,d}	California Test 521	

^aAs specified in section 90-1.01D(4).

^bUse ASTM C173/C173M for lightweight concrete.

^cMark each cylinder with the Contract number, the date and time of sampling, and the weighmaster certificate number.

^dYou may need additional test samples to facilitate your schedule.

90-1.01D(10)(b)(v) Inspection Reports

Document each inspection performed by a QC inspector in an inspection report that includes:

1. Contract number
2. Mix design number
3. Date and time of inspection
4. Plant location
5. Concrete placement location
6. Batch number
7. Reviewed copies of weighmaster certificates
8. Description of the inspection performed
9. Name, certification number, and signature of the QC inspector

90-1.01D(10)(b)(vi) Rejection of Material

If any of the QC concrete test results fail to comply with the specified requirements, the batch of concrete must not be incorporated in the work. Notify the Engineer. Repeat the QC concrete tests on each subsequent batch until the test results comply with the specified requirements.

If 3 consecutive batches fail to comply with the specified requirements, (1) revise concrete operations as necessary to bring the concrete into compliance and (2) increase the frequency of QC testing. The revisions must be authorized before resuming production. After production resumes, you must receive authorization before returning to the QC testing frequency authorized in the QC plan.

90-1.01D(11) Department Acceptance

90-1.01D(11)(a) General

Reserved

90-1.01D(11)(b) Cast-In-Place Structural Concrete Members

The Department accepts concrete incorporated into CIP structural concrete members based on only the Department's test results. QC test results will not be used for Department acceptance.

Replace the table in the 1st paragraph of section 90-1.02A with:

10-18-19

Type of work	Maximum length change of laboratory cast specimens at 28 days drying (average of 3) (percent)
Paving and approach slab concrete	0.050
Bridge deck concrete	0.032

Add to the end of section 90-1.02A:

10-18-19

For new bridge decks or PCC deck overlays, fibers must comply with ASTM D7508. Microfibers must be from 1/2 to 2 inches long. Macrofibers must be from 1 to 2-1/2 inches long.

Replace the 2nd paragraph of section 90-1.02B(1) with:

10-15-21

Unless otherwise specified, the cementitious material must be one of the following:

1. Combination of Type II or V portland cement and SCM
2. Combination of blended cements and SCM
3. Blended cement

Replace section 90-1.02B(2) with:

10-15-21

90-1.02B(2) Cement

Portland cement must comply with ASTM C150/C150M Type II, III or V, except:

1. Alkali content must not exceed 0.60 percent by mass of alkalies as $Na_2O + 0.658 K_2O$ when determined under AASHTO T 105
2. Autoclave expansion must not exceed 0.50 percent
3. C_3S content of Type II cement must not exceed 65 percent
4. Type III cement may be used only if specified or authorized

Blended cement, including portland limestone cement, Type IL must comply with AASHTO M 240, except:

1. Maximum limits on pozzolan content do not apply
2. Sulfate resistance must be moderate (MS) or high (HS)
3. Alkali content in cement portion of blended cements must not exceed 0.60 percent by mass of alkalies as $Na_2O + 0.658 K_2O$ when determined under AASHTO T 105

Replace item 3 in the list in the 1st paragraph of section 90-1.02B(3) with:

04-16-21

3. Raw or calcined natural pozzolans complying with AASHTO M 295, Class N, except the maximum allowable loss on ignition is 10 percent, and either of the following:
 - 3.1. Available alkali as $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ must not exceed 1.5 percent when tested under ASTM C311.
 - 3.2. Total alkali as $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ must not exceed 5.0 percent when tested under AASHTO T 105.

Replace the 3rd paragraph of section 90-1.02B(3) with:

10-15-21

The quantity of cement and SCM in concrete must comply with the minimum cementitious material content specified.

Replace the 4th paragraph of section 90-1.02B(3) with:

10-15-21

The SCM content in concrete must comply with one of the following:

1. Any combination of cement and SCMs, satisfying equations 1 and 2:

Equation 1:

$$[(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)]/MC \geq X$$

where:

UF = silica fume, metakaolin, or UFFA, including the quantity in blended cement, lb/cu yd

FA = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of up to 10 percent, including the quantity in blended cement, lb/cu yd

FB = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of greater than 10 percent and up to 15 percent, including the quantity in blended cement, lb/cu yd

SL = GGBFS, including the quantity in blended cement, lb/cu yd

MC = minimum quantity of cementitious material specified, lb/cu yd

X = 1.8 for innocuous aggregate, 3.0 for all other aggregate

Equation 2:

$$MC - MSCM - PC \geq 0$$

where:

MC = minimum quantity of cementitious material specified, lb/cu yd

MSCM = minimum sum of SCMs that satisfies equation 1, lb/cu yd

PC = quantity of Type IL cement or portland cement, including the quantity in blended cement, lb/cu yd

2. 15 percent Class F fly ash with at least 48 oz of LiNO_3 solution added per 100 lb of portland cement or portland limestone cement. The CaO content of the fly ash must not exceed 15 percent.

04-15-22

Delete the 5th paragraph of section 90-1.02C(2).

Delete the 3rd paragraph of section 90-1.02C(3).**Replace the 5th and 6th paragraphs of section 90-1.02F(4)(a) with:**

10-15-21

Except for Type IL cement, weigh bulk blended cement in an individual hopper and keep it separate from the aggregates until the ingredients are released for discharge into the mixer.

Bulk portland cement, Type IL cement and SCM may be weighed in separate weigh hoppers or in the same weigh hopper. Keep the cement and SCM separate from the aggregates until the ingredients are released for discharge into the mixer.

Replace items 1 and 2 in the list in the 5th paragraph of section 90-1.02F(4)(c) with:

04-16-21

1. Test results for 1 compressive strength test consisting of the average strength of cylinders made from material taken within the first 1/3, and 1 compressive strength test consisting of the average strength of cylinders made from material taken within the last 1/3, of a single batch of concrete discharged from the stationary mixer. Strength tests and cylinder preparation must comply with section 90-1.01D(5).
2. Calculations demonstrating that the average of the compressive strengths taken within the first 1/3 of the batch do not differ by more than 7.5 percent from the average of the compressive strengths taken within the last 1/3 of the batch.

Replace the table in section 90-1.02G(6) with:

04-19-19

Type of work	Nominal		Maximum	
	Penetration	Slump	Penetration	Slump
	(in)	(in)	(in)	(in)
Concrete pavement	0–1	--	1.5	--
Nonreinforced concrete members	0–1.5	--	2	--
Reinforced concrete structures with:				
Sections over 12 inches thick	0–1.5	1–3	2.5	5
Sections 12 inches thick or less	0–2	1–4	3	6
Concrete placed under water	--	6–8	--	9
CIP concrete piles	2.5–3.5	5–7	4	8

Replace the 2nd paragraph of section 90-1.02H with:

10-15-21

The cementitious material to be used in the concrete must be a combination of Type II or V portland cement or Type IL (MS or HS) cement and SCM.

Replace the 6th paragraph of section 90-1.02H with:

10-15-21

For pavement, the total cementitious material must be composed of one of the following options, by weight:

1. 25 percent natural pozzolan or fly ash with a CaO content of up to 10 percent and 75 percent portland cement or Type IL cement
2. 20 percent natural pozzolan or fly ash with a CaO content of up to 10 percent, 5 percent silica fume, and 75 percent portland cement or Type IL cement
3. 12 percent silica fume, metakaolin, or UFFA, and 88 percent portland cement or Type IL cement
4. 50 percent GGBFS and 50 percent portland cement or Type IL cement

For structures, the total cementitious material must be composed of one of the following options, by weight:

1. 25 percent natural pozzolan or fly ash with a CaO content of up to 10 percent and 75 percent portland cement or Type IL cement.
2. 20 percent natural pozzolan or fly ash with a CaO content of up to 10 percent, 5 percent silica fume, and 75 percent portland cement or Type IL cement.
3. 12 percent silica fume, metakaolin, or UFFA, and 88 percent portland cement or Type IL cement.
4. 50 percent GGBFS and 50 percent portland cement or Type IL cement.
5. 25 to 50 percent fly ash with a CaO content of up to 10 percent, and no natural pozzolan. The remaining portion of the cementitious material must be (1) portland cement, (2) Type IL cement, or (3) a combination of portland cement or Type IL cement and UFFA, metakaolin, GGBFS, or silica fume.

Replace the 3rd paragraph of section 90-1.02I(2)(b) with:

10-15-21

The cementitious material must be composed of any combination of (1) either portland cement or Type IL cement and (2) at least 1 SCM satisfying the following equation:

Equation 1:

$$[(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)]/TC \geq X$$

Replace section 90-1.03B(2) with:

04-19-19

90-1.03B(2) Water Method

The water method must consist of keeping the concrete continuously wet by applying water for a curing period of at least 7 days after the concrete is placed.

Keep the concrete surface wet by applying water with an atomizing nozzle that forms a mist until the surface is covered with curing media. Do not allow the water to flow over or wash the concrete surface. At the end of the curing period, remove curing media.

Use any of the following curing media to retain moisture:

1. Mats, rugs, or carpets
2. Earth or sand blankets
3. Sheeting materials complying with the durability and water vapor transmission rate specified in section 5 of ASTM C171

To ensure proper coverage during curing:

1. Cover the entire concrete surface with the curing media
2. Secure the curing media joints to retain moisture
3. Keep the curing media within 3 inches of the concrete at all points along the surface being cured

Monitor concrete surface temperature during curing. Ensure that surface temperature is maintained at 140 degrees F or below. If the surface temperature exceeds 140 degrees F, determine cause and provide alternative curing methods to the Engineer for authorization.

Add to section 90-3.01D:

10-16-20

90-3.01D(5) Shrinkage

Items 2 and 3 in the 1st paragraph of section 90-1.01D(3) do not apply.

Test the RSC for shrinkage as specified in section 90-1.01D(3) except:

1. Remove each specimen from the mold at the time of 1 hour +/- 15 min before the initial comparator reading and place the specimen in lime-saturated water at 73 ± 3 degrees F until the initial comparator reading
2. Take a comparator reading at an age of 10 times the final set time or 24 hours, whichever is earlier, and record it as the initial reading

Replace footnote b for the table in item 2.1 in the 1st paragraph of section 90-3.02A with:

04-16-21

^bIf you use accelerating chemical admixtures, include them when testing

10-19-18

Delete the 2nd paragraph of section 90-3.02A.

Replace the 7th paragraph of section 90-3.02B(4) with:

10-16-20

The volumetric mixer must be equipped such that accuracy checks can be made. Recalibrate the proportioning devices at a minimum of every 90 days or when you change the source or type of any ingredient.

Replace the 2nd paragraph of section 90-4.01A with:

10-18-19

The specifications for (1) shrinkage in section 90-1.02A, (2) shrinkage reducing chemical admixture in section 51-1.02B, and (3) polymer fibers in section 51-1.02B do not apply to PC concrete members.

Add to section 90-4.01C(1):

04-19-19

Submit your QC test results for the tests performed under section 90-4.01D as an informational submittal. The QC test results must be submitted electronically through the Data Interchange for Materials Engineering website within 3 business days of completion of each QC test and must include the concrete mix design number.

Replace the table titled "Concrete QC Tests" in the 5th paragraph of section 90-4.01D(2)(c) with:

04-16-21

Concrete QC Tests

Quality characteristic	Test method	Minimum testing frequency
Compressive strength	ASTM C172/C172M, ASTM C31/C31M, and ASTM C39/C39M	Once per 100 cu yd of concrete cast, or every day of casting, whichever is more frequent
Slump	ASTM C143/C143M	
Temperature at time of mixing	ASTM C1064/C1064M	
Density	ASTM C138	Once per 600 cu yd of concrete cast or every 7 days of batching, whichever is more frequent
Air content	ASTM C231/C231M or ASTM C173/C173M ^a	If concrete is air entrained, once for each set of cylinders, and when conditions warrant

^aASTM C173/C173M must be used for lightweight concrete.

Store samples in clean and airtight sealed containers. Samples taken must be placed in wide mouth plastic containers and taken in the presence of the Engineer. Samples must be stored at temperatures from 40 to 120 degrees F until submitted for testing.

94-1.02 MATERIALS

94-1.02A General

Asphaltic emulsions must be composed of a bituminous material uniformly emulsified with water and an emulsifying or a stabilizing agent. Polymer-modified asphaltic emulsion must contain a polymer.

Rapid-setting asphaltic emulsions must be tested within 7 days after delivery to job site. All other asphaltic emulsions must be tested within 14 days of delivery to job site. The asphaltic emulsion must be homogeneous after thorough mixing and not separated by freezing. Asphaltic emulsion separated by freezing will not be tested.

94-1.02B Slow-Setting Anionic Asphaltic Emulsions

Slow-setting anionic asphaltic emulsion must comply with the requirements shown in the following table:

Slow-Setting Anionic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade SS-1	Grade SS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	
Storage stability test, 1 day (max, %)		1	
Cement mixing test (max, %)		2.0	
Sieve test (max, %)		0.10	
Residue from distillation or evaporation test (min, %) ^a		57	
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5

^aDistillation is the defining test if there is a conflict with evaporation.

94-1.02C Slow-Setting Cationic Asphaltic Emulsions

Slow-setting cationic asphaltic emulsion must comply with the requirements shown in the following table:

Slow-Setting Cationic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade CSS-1	Grade CSS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	
Storage stability test, 1 day (max, %)		1	
Particle charge ^a		Positive	
Cement mixing test (max, %)		2.0	
Sieve test (max, %)		0.10	
Residue from distillation or evaporation test (min, %) ^b	57		
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–250	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5

^aMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

^bDistillation is the defining test if there is a conflict with evaporation.

94-1.02D Rapid-Setting Cationic Asphaltic Emulsions

Rapid-setting cationic asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Cationic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement			
		Grade CRS-1	Grade CRS-2	Grade CRS-1h	Grade CRS-2h
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	100–400	20–100	100–400
Storage stability test, 1 day (max, %)		1			
Demulsibility (min, %) ^a		40			
Particle charge ^b		Positive			
Sieve test (max, %)		0.10			
Residue from distillation or evaporation test (min, %) ^c		60	65	60	65
Tests on residue:					
Penetration, 25 °C (dmm)	AASHTO T 49	100–250		40–90	
Ductility, 25 °C, 50 mm/minute (min, mm)	AASHTO T 51	400		400	
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5		97.5	

^aUse 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.

^bMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

^cDistillation is the defining test if there is a conflict with evaporation.

94-1.02E Cationic Emulsified Recycling Agent

Cationic emulsified recycling agent for cold-in-place recycling must comply with the requirements shown in the following table:

Cationic Emulsified Asphalt Requirements

Quality characteristic	Test method	Requirement Emulsified recycling agent
Sieve test (max, %)	AASHTO T 59	0.10
Residue from distillation or evaporation test (min, %) ^a		63
Sieve test (max, %)		Positive
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–120
Ductility, 25 °C (min, mm)	AASHTO T 51	400
Creep stiffness:	AASHTO T 313	
Test temperature (°C)		-12
S-value (max, MPa)		300
M-value (min)		0.300

^aDistillation is the defining test if there is a conflict with evaporation.

^bMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

94-1.02F Rapid-Setting Polymer-Modified Asphaltic Emulsions

Rapid-setting polymer-modified asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Polymer-Modified Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade PMCRS-2	Grade PMCRS-2h
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59 ^e	100–400	
Storage stability test, 1 day (max, %)		1	
Sieve test (max, %)		0.30	
Demulsibility (min, %) ^a		40 ^b	
Particle charge ^b		Positive	
Residue from distillation or evaporation test (min, %) ^c		65	
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Torsional recovery (min, %) ^d or Elastic recovery, 25 °C (min, %) ^d	California Test 332	20	20
	AASHTO T 301	65	65
Penetration, 4 °C, 200 g for 60 seconds (min, dmm)	AASHTO T 49	6	6
Ring and Ball Softening Point (min, °C)	AASHTO T 53	57	57

^aUse 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.

^bMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

^cDistillation is the defining test if there is a conflict with evaporation.

^dElastic recovery is the defining test if there is a conflict with torsional recovery.

^eDistillation temperature of 350 °F.

94-1.02G Bonded Wearing Course Asphaltic Emulsions

Bonded wearing course asphaltic emulsion must comply with the requirements shown in the following table:

Bonded Wearing Course Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59 ^c	20–100
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.05
Particle charge ^a		Positive
Residue from distillation or evaporation test (min, %) ^b		63
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	70–150
Torsional recovery (min, %) ^d	California Test 332	40

^aMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

^bDistillation is the defining test if there is a conflict with evaporation.

^cDistillation temperature of 350 °F.

^dMeasure the entire arc of recovery at 25 °C.

94-1.02H Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsions

Rapid-setting polymer-modified rejuvenating asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement Grade PMRE
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59 ^d	50–350
Storage stability test, 1 day (max, %)		1
Sieve (max, %)		0.30
Oil distillate (max, %)		0.5
Particle charge ^a		Positive
Demulsibility (min, %) ^b		40
Residue from distillation or evaporation test (min, %) ^c		65
pH	ASTM E70	2.0–5.0
Tests on residue:		
Viscosity, at 60 °C (max, Pa-s)	AASHTO T 202 ^{e, f}	5000
Penetration, 4 °C (dmm)	AASHTO T 49	40–70
Elastic recovery, 25 °C (min, %)	AASHTO T 301 ^g	60

^aMust comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

^bIf the product is to be diluted, demulsibility is waived.

^cDistillation is the defining test if there is a conflict with evaporation.

^dDistillation temperature of 350 °F.

^eIf it is suspected that a sample may contain solid material, strain the melted sample into the container through a No. 50 (300-µm) sieve conforming to Specification E 11.

^fUse an AI- 200 glass capillary tube to run the test. If the viscosity is 4000 or above, use an AI 400 instead.

^gElastic recovery, hour glass sides, pull to 20 cm, hold 5 minutes then cut, let sit 1 hour.

Rejuvenating agent for rapid-setting polymer-modified rejuvenating asphaltic emulsion must comply with the requirements shown in the following table:

Rejuvenating Agent Requirements

Quality characteristic	Test method	Requirement
Tests on rejuvenating agent:		
Viscosity, at 60 °C (cSt)	AASHTO T 201	50–175
Flash point (min, °C)	AASHTO T 48	193
Saturate (max, % by weight)	ASTM D2007	30
Asphaltenes (max)	ASTM D2007	1.0
Tests on rejuvenating agent Rolling Thin-Film Oven Test residue:		
Weight change (max, %)	AASHTO T 240	6.5
Viscosity ratio (max) ^a		3

^aRolling Thin-Film Oven Test (RTFOT) viscosity divided by the original viscosity.

94-1.021 Quick-Setting Asphaltic Emulsions

Quick-setting asphaltic emulsion must comply with the requirements shown in the following table:

Quick-Setting Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement			
		Anionic		Cationic	
		Grade QS-1	Grade QS-1h	Grade CQS-1	Grade CQS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90			
Storage stability test, 1 day (max, %)		1			
Particle charge ^a		--	Positive		
Sieve test (max, %)		0.30			
Residue from distillation or evaporation test (min, %) ^b		57			
Tests on residue:					
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5	97.5	97.5

^aIf the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS-1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS-1h asphaltic emulsion must have a maximum pH of 6.7.

^bDistillation is the defining test if there is a conflict with evaporation.

94-1.02J Quick-Setting Polymer-Modified Cationic Asphaltic Emulsions

Quick-setting polymer-modified cationic asphaltic emulsion must comply with the requirements shown in the following table:

Quick-Setting Polymer-Modified Cationic Asphaltic Emulsions

Quality characteristic	Test method	Requirement Grade PMCQS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59 ^d	15–90
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.30
Particle charge ^a		Positive
Residue from distillation or evaporation test (min, %) ^b		60
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400
Torsional recovery (min, %) ^c	California Test 332	18
or		
Elastic recovery, 25 °C (min, %) ^c	AASHTO T 301	60

^aIf the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70.

^bDistillation is the defining test if there is a conflict with evaporation.

^cElastic recovery is the defining test if there is a conflict with torsional recovery.

^dDistillation temperature of 350 °F.

94-1.02K Micro Surfacing Emulsions

Micro surfacing emulsion must comply with the requirements shown in the following table:

Micro Surfacing Emulsion Requirements

Quality characteristic	Test method	Requirement Grade MSE
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59 ^c	15–90
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.30
Particle charge ^a		Positive
Residue from distillation or evaporation test (min, %) ^b		62
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–90
Softening point (min, °C)	AASHTO T 53	57
Torsional recovery (min, %) ^d	California Test 332	20
or		
Elastic recovery, 25 °C (min, %) ^d	AASHTO T 301	65

^aIf the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70.

^bDistillation is the defining test if there is a conflict with evaporation.

^cDistillation temperature of 350 °F.

^dElastic recovery is the defining test if there is a conflict with torsional recovery.

94-1.03 CONSTRUCTION

Not Used

94-1.04 PAYMENT

The quantity of asphaltic emulsion is the weight determined before the addition of any water.

The weight of asphaltic emulsion is determined from volumetric measurements if:

1. Partial loads are used
2. Scale is not available within 20 miles
3. Asphaltic emulsion is delivered in:
 - 3.1. Trucks with each tank calibrated and accompanied by its measuring stick and calibration card
 - 3.2. Trucks equipped with a vehicle tank meter and a calibrated thermometer that determines the asphalt temperature at delivery

For volumetric measurements, the measured volume of asphaltic emulsion is reduced to the volume the material would occupy at 60 degrees F. One ton of asphaltic emulsion at 60 degrees F equals 240 gal. One gallon of asphaltic emulsion at 60 degrees F equals 8.33 lb.

Convert volume to weight using the factors shown in the following table:

Replace the row for *Apparent opening size* in the table in the 3rd paragraph of section 96-1.02I with:

04-17-20

Apparent opening size (min and max, μm (US Sieve))	ASTM D4751	150(100)–212(70)	150(100)–212(70)
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Replace the row for *Apparent opening size* in the table in the 2nd paragraph of section 96-1.02O with:

04-17-20

Apparent opening size (max, μm (US Sieve))	ASTM D4751	300(50)	300(50)	600(30)	300(50)	300(50)
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Replace the 3rd table in the 3rd paragraph of section 96-1.02R with:

10-19-18

Cushion Fabric

Quality characteristic	Test method	Requirement					
		Class 10	Class 12	Class 16	Class 24	Class 32	Class 60
Mass per unit area (oz/sq yd)	ASTM D5261	10	12	16	24	32	60
Grab tensile break strength (min, lb)	ASTM D4632	230	300	370	450	500	630
Grab tensile break elongation (min, %)	ASTM D4632	50					
Puncture strength (min, lb)	ASTM D6241	700	800	900	1100	1700	2400
Trapezoidal tear strength (min, lb)	ASTM D4533	95	115	145	200	215	290
UV resistance (min, %)	ASTM D7238	70					