STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

AND

SPECIAL PROVISIONS

FOR BUILDING CONSTRUCTION ON STATE HIGHWAY IN ALPINE, AMADOR AND CALAVERAS COUNTIES AT VARIOUS LOCATIONS

In District 10 On Route 4,88

Under

***Bid* book dated November 4, 2013**	***Standard Specifications* dated 2010**
Project plans approved July 22, 2013	***Standard Plans* dated 2010**

Identified by

Contract No. 10-0X2104

10-Alp,Ama,Cal-4,88-Var

Project ID 1012000181

Electronic Advertising Contract

Bids open Wednesday, December 11, 2013 **OSD**

Dated November 4, 2013 **IH**

CONTRACT NO. 10-0X2104
PROJECT ID: 1012000181

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

HIGHWAYS

6/12/13

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Jose A. Alicea II
No. C 64817
Exp. 06/30/15
CIVIL
STATE OF CALIFORNIA

ARCHITECT

9/19/2013

LICENSED ARCHITECT DATE

LICENSED ARCHITECT
ANTHONY V. MANANSALA
No. C-32260
Exp. 04-30-2015
STATE OF CALIFORNIA

STRUCTURES

9-19-13

REGISTERED CIVIL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
TOM R. MESICH
No. C-46748
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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.

A10A	Abbreviations (Sheet 1 of 2)
RSP A10B	Abbreviations (Sheet 2 of 2)
A10C	Lines and Symbols (Sheet 1 of 3)
A10D	Lines and Symbols (Sheet 2 of 3)
A10E	Lines and Symbols (Sheet 3 of 3)
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)
B0-3	Bridge Details
RSP B3-7B	Retaining Wall Type 6 (Case 2)
RSP B3-7C	Retaining Wall Type 6 Details
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 and Abbreviations)
RSP ES-8A	Electrical Systems (Non-Traffic Pull Box)
RSP ES-8B	Electrical Systems (Traffic Pull Box)

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
A77A1	07-19-13	A77J4	07-19-13	ES-6J	07-19-13
A77A2	07-19-13	A77K1	07-19-13	ES-7I	07-19-13
A77B1	07-19-13	A77K2	07-19-13	ES-8	01-20-12
A77C1	07-19-13	P3	07-19-13	ES-10	07-20-12
A77C2	07-19-13	C8A	07-19-13		
A77C3	07-19-13	C8B	07-19-13		
A77C4	07-19-13	C8C	07-19-13		
RSP A77C5	07-19-13	B3-1	04-20-12		
RSP A77C6	07-19-13	B3-2	04-20-12		
RSP A77C7	07-19-13	B3-3	04-20-12		
RSP A77C8	07-19-13	B3-4	04-20-12		
RSP A77C9	07-19-13	B3-7	04-20-12		
RSP A77C10	07-19-13	B3-8	04-20-12		
A77E1	07-19-13	S7	07-19-13		
A77E2	07-19-13	S14	07-19-13		
A77E3	07-19-13	S41	07-19-13		
A77E4	07-19-13	S42	07-19-13		
A77E5	07-19-13	S43	07-19-13		
A77E6	07-19-13	S44	07-19-13		
A77F1	07-19-13	S45	07-19-13		
A77F2	07-19-13	S46	07-19-13		
A77F3	07-19-13	S47	07-19-13		
A77F4	07-19-13	S120	07-19-13		
A77F5	07-19-13	S121	07-19-13		
A77G1	07-19-13	S122	07-19-13		
A77G2	07-19-13	S123	07-19-13		
A77G3	07-19-13	S124	07-19-13		
A77G4	07-19-13	S125	07-19-13		
A77G5	07-19-13	S126	07-19-13		
A77G6	07-19-13	S127	07-19-13		
A77G7	07-19-13	S128	07-19-13		
A77G8	07-19-13	S129	07-19-13		
A77H1	07-19-13	S130	07-19-13		
A77H2	07-19-13	S131	07-19-13		
A77H3	07-19-13	S132	07-19-13		
A77I1	07-19-13	S133	07-19-13		
A77I2	07-19-13	S134	07-19-13		
A77J1	07-19-13	S135	07-19-13		
A77J2	07-19-13	ES-6H	07-19-13		
A77J3	07-19-13	ES-6I	07-19-13		

NOTICE TO BIDDERS

Bids open Wednesday, December 11, 2013

Dated November 4, 2013

General work description: Construct wash buildings.

The Department will receive sealed bids for BUILDING CONSTRUCTION ON STATE HIGHWAY IN ALPINE, AMADOR AND CALAVERAS COUNTIES AT VARIOUS LOCATIONS.

District-County-Route-Post Mile: 10-Alp,Ama,Cal-4,88-Var

Contract No. 10-0X2104

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

Bids must be on a unit price basis.

Complete the work within 265 working days.

The estimated cost of the project is $5,900,000.

No prebid meeting is scheduled for this project.

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

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

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

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

http://www.dot.ca.gov/hq/esc/oe/inquiry/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 Web site, http://www.dir.ca.gov, or from the Department's Labor Compliance Office of the district in which the work is located.

The 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.

Department of Transportation

THM

BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070030	LEAD COMPLIANCE PLAN	LS	LUMP SUM
2	130100	JOB SITE MANAGEMENT	LS	LUMP SUM
3	130200	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
4	130900	TEMPORARY CONCRETE WASHOUT	LS	LUMP SUM
5	190101	ROADWAY EXCAVATION	CY	1,450
6 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	CY	80
7 (F)	260203	CLASS 2 AGGREGATE BASE (CY)	CY	820
8	390132	HOT MIX ASPHALT (TYPE A)	TON	900
9	397005	TACK COAT	TON	2
10 (F)	475000	RETAINING WALL STEM (TYPE 6)	SQFT	540
11 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	CY	19
12 (F)	520101	BAR REINFORCING STEEL	LB	2,510
13	731521	MINOR CONCRETE (SIDEWALK)	CY	4
14	869050	GUARD POST	EA	12
15	994650	BUILDING WORK	LS	LUMP SUM

SPECIAL PROVISIONS

DIVISION I GENERAL PROVISIONS

2 BIDDING

Add to section 2-1.06B:

The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the *Information Handout*	1. Limited Asbestos and Deteriorated Lead-Containing Paint Survey Report - Camp Connell, Peddler Hill and Woodfords Maintenance Stations 2. Asbestos and Lead-Containing Paint Survey Report - Pine Grove Maintenance Station 3. Initial Site Assessment (ISA) - Pine Grove Maintenance Station 4. Initial Site Assessment (ISA) - Woodfords Maintenance Station 5. Initial Site Assessment (ISA) - Camp Connell Maintenance Station 6. Initial Site Assessment (ISA) - Peddler Hill Maintenance Station 7. Foundation Report - Camp Connell Maintenance Station 8. Percolation Test - Camp Connell Maintenance Station 9. Foundation Report - Peddler Hill Maintenance Station 10. Percolation Test - Peddler Hill Maintenance Station 11. Foundation Report - Pine Grove Maintenance Station 12. Percolation Test - Pine Grove Maintenance Station 13. Foundation Report - Woodfords Maintenance Station 14. Percolation Test - Woodfords Maintenance Station

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6 CONTROL OF MATERIALS

Add to section 6-2.03:

The Department furnishes you with:

Liquefied petroleum gas (LPG)

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7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Replace section 7-1.02K(6)(j)(iii) with:

7-1.02K(6)(j)(iii) Earth Material Containing Lead

Section 7-1.02K(6)(j)(iii) includes specifications for handling, removing, and disposing of earth material containing lead.

Submit a lead compliance plan.

Lead is present in earth material on the job site. The average lead concentrations are below 1,000 mg/kg total lead and below 5 mg/L soluble lead. The material on the job site:

1. Is not a hazardous waste
2. Does not require disposal at a permitted landfill or solid waste disposal facility

Lead has been detected in material to a depth of 2 feet in unpaved areas of the highway. Levels of lead found on the job site range from less than 5 to 325 mg/kg total lead with an average concentration of 25.3 mg/kg total lead as analyzed by EPA test method 6010 or EPA test method 7000 series and based upon a 95 percent upper confidence limit.

Handle the material under all applicable laws, rules, and regulations, including those of the following agencies:

1. Cal/OSHA
2. CA RWQCB, Region 5 — Central
3. CA Department of Toxic Substances Control

If the material is disposed of:

1. Disclose the lead concentration of the material to the receiving property owner when obtaining authorization for disposal on the property
2. Obtain the receiving property owner's acknowledgment of lead concentration disclosure in the written authorization for disposal
3. You are responsible for any additional sampling and analysis required by the receiving property owner

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DIVISION V SURFACINGS AND PAVEMENTS
39 HOT MIX ASPHALT

Add to section 39-1.01:

Produce and place HMA Type A under the Standard construction process.

Add to section 39-1.02C:

Asphalt binder used in HMA Type A must be PG 64-28.

Add to section 39-1.02E:

Aggregate used in HMA Type A must comply with the 3/4-inch HMA Types A and B gradation.

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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 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."

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 to OSD, Documents Unit. Notify the Engineer of the submittal. Include the date and contents of the submittal in the notification.
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 (Not Used)

1.7 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. Distribute overhead and profit proportionally across all line items of cost.

1.8 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

1.9 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 2 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.

1.10 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 99-01000

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 the Contractor.

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 Engineer as he determines 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.

Stakes and marks set by the Engineer must be carefully preserved by the Contractor. In case such stakes and marks are destroyed or damaged they will be replaced at the Engineer's earliest convenience. The Contractor will be charged for the cost of necessary replacement or restoration of such stakes and marks which in the judgment of the Engineer were carelessly or willfully destroyed or damaged by the Contractor's operations. This charge will be deducted from any moneys due or to become due the Contractor.

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

Existing Utilities and Equipment:

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

Prior to construction, the Contractor 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:

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

The Contractor 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 the Contractor 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 or masonry, 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.

At new door openings in concrete or masonry, full depth saw cuts must be made from both faces. Overcuts must not be made at corners. Remaining material at corners must be chipped out and the surfaces ground smooth.

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 the Contractor's operation must be restored to original condition at the Contractor's 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.

Anchor bolts and reinforcement must be removed at least one inch below the surrounding surfaces, and the resulting hole must be patched with cement mortar.

Existing reinforcement that is to be incorporated into the new work must be protected from damage and thoroughly cleaned before being embedded in new concrete.

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

99-02072 RELOCATING MATERIALS AND EQUIPMENT

99-02072A General

99-02072A(1) Summary

Scope: This work consists of relocating existing materials and equipment.

99-02072A(2) Definitions

Not Used

99-02072A(3) Submittals

Not Used

99-02072(4) Quality Control and Assurance

Not Used

99-02072B Materials

Not Used

99-02072C Construction

99-02072C(1) Relocation

Materials or equipment to be relocated must be removed carefully to avoid damage to the materials or equipment or to the materials or equipment which are to remain. Assemblies to be relocated which require dismantling for removal must be matchmarked before dismantling.

The Contractor must notify the Engineer prior to the relocation work in order that the materials or equipment may be inspected for existing damage.

Materials or equipment to be relocated must have all adhering concrete, mastics, earth, or other deleterious materials removed and must have all exterior surfaces cleaned.

Materials or equipment which are damaged by the Contractor's operations must be replaced or restored to match the condition of the materials or equipment prior to the beginning of the Contractor's operations. Replacement or restoration of damaged materials or equipment must be at the Contractor's expense.

Connections, anchorages, and fasteners for relocated materials and equipment must match existing and must be furnished and installed by the Contractor. Assemblies which have been dismantled must be reassembled to match the existing installation. Relocated materials and equipment must be installed as required for new work.

Modifications to wiring and plumbing to accommodate relocated items must be as shown. Ends of piping and conduits to be abandoned must be capped.

Surfaces that are exposed to view upon removal or relocation of materials or equipment must be patched. Bumps must be removed and depressions filled, and the surface finished to match the existing surfaces. Depressions in concrete less than one inch deep must be deepened to one-inch minimum depth before filling with cement mortar.

99-02072C(2) Disposal

If the Engineer determines that the materials or equipment from existing facilities to be reused in the work is unsuitable for use, the materials or equipment must be handled under section 14-10. The unsuitable material or equipment must be replaced as ordered by the Engineer and will be change order work.

99-02072D Payment

Not Used

99-02074 REMOVING PORTIONS OF EXISTING ROOF COVERING

99-02074A General

99-02074A(1) Summary

Scope: This work consists of removing portions of the existing roof covering.

99-02074A(2) Definitions

Not Used

99-02074A(3) Submittals

Not Used

99-02074A(4) Quality Control and Assurance

Not Used

99-02074B Materials

Not Used

99-02074C Construction

Consult with roofing manufacturer to determine:

1. Whether roofing material can be recycled
2. How to minimize material not eligible for recycling

Existing roof covering must be removed to the top of existing insulation. Removal of portions of existing roof covering must be done carefully to minimize damage to portions of the roof covering which are to remain.

Holes, tears, breaks, and abrasions to existing insulation must be repaired or insulation must be removed and replaced to match the original condition of the insulation.

Surface irregularities resulting from the removal of the existing roof covering must be filled or trimmed to provide a flat substrate surface for receiving the new roof covering.

At locations where integral felt and primer have been scraped from the top of the existing board insulation, the insulation must be repaired with polyurethane foam and the surface must be primed and covered with one layer of Type 15 roofing felt before the application of additional roofing materials. Foam for repairing existing polyurethane board insulation must be commercially available, single component, atmospherically moisture cured, semi-rigid polyurethane foam in a spray can container, suitable for repair of urethane foam insulation. Repair insulation under the insulation manufacturer's instructions.

Removal of portions of existing roof covering during any day must not extend beyond the area to be reroofed that day. Insulation exposed by removal of existing roof covering must be covered by new roofing or cutoffs the same day as removal.

Portions of insulation must be removed to full depth at the locations where new wood nailers are to be placed. Removal of portions of insulation must be to neat lines.

Damage to the roofing insulation or decking caused by the Contractor's operations must be repaired or replaced at the Contractor's expense.

Disposal: Removed materials must be recycled or disposed of under section 14-10.

99-02074D Payment

Not Used

99-02075 ABANDON PORTIONS OF WASTE DISPOSAL SYSTEM

99-02075A General

99-02075A(1) Summary

Scope: This work consists of abandoning portions of the existing waste disposal system.

99-02075A(2) Definitions

Not Used

99-02075A(3) Submittals

Not Used

99-02075A(4) Quality Control and Assurance

Not Used

99-02075B Materials

Not Used

99-02075C Construction

Staging of Work: Work that will curtail the use of the waste disposal system must not be done until the facilities utilizing the system are closed and are no longer required.

Disposal: Sewage facilities to be abandoned must be pumped out and the sewage and sediment removed from such facilities must be disposed of.

Abandoning Facilities:

Each pipe entering or exiting the sewage disposal system to be abandoned must be closed by a tight fitting plug or wall of concrete not less than 0.5 foot thick. Such concrete must be commercial quality concrete and must contain not less than 505 pounds of cement per cubic yard of concrete.

The top cover of the structure must be removed and the bases must be broken to prevent entrapment of water. The sewage structures to be abandoned must be backfilled with sand, unless otherwise shown. Sand backfill must be consolidated by vibrating or other methods.

Manhole Frames and Covers: Manhole frames and covers which are to be removed must become the property of the Contractor and recycled or disposed of under section 10-2.02B. Such disposal must comply with the laws, rules, and regulations of all agencies having jurisdiction at the disposal site.

99-02075D Payment

Not Used

99-02076 REMOVE WASTE DISPOSAL SYSTEM

99-02076A General

99-02076A(1) Summary

Scope: This work consists of removing the existing waste disposal system.

99-02076A(2) Definitions

Not Used

99-02076A(3) Submittals

Not Used

99-02076A(4) Quality Control and Assurance

Not Used

99-02076B Materials

Not Used

99-02076C Construction

Staging of Work: Work that will curtail the use of the waste disposal system must not be done until the facilities utilizing the system are closed and are no longer required.

Disposal: Sewage facilities to be removed must be pumped out and the sewage and sediment removed from such facilities must be disposed of.

Abandoning Piping: Each pipe entering or exiting the sewage disposal system to be removed must be closed by a tight fitting plug or wall of concrete not less than 0.5 foot thick. Such concrete must be commercial quality concrete and must contain not less than 505 pounds of cement per cubic yard of concrete.

Manhole Frames and Covers: Manhole frames and covers which are to be removed must become the property of the Contractor and recycled or disposed of under section 10-2.02B. Such disposal must comply with the laws, rules, and regulations of all agencies having jurisdiction at the disposal site.

99-02076D Payment

Not Used

99-02080 ASBESTOS RELATED WORK

99-02080A General

99-02080A(1) Summary

This section includes specifications for asbestos related work.

If asbestos will be disturbed or removed in order to perform the work for this project, any disturbance or removal of asbestos must comply with the regulations. Apply the most stringent requirements if there is a conflict or overlap of requirements.

The results of the asbestos survey conducted at Pine Grove Maintenance Station are contained in the report Asbestos and Lead Containing Paint Survey Report, PROJECT NO. S9525-01-60, February 2013, prepared by Geocon Consultants, Inc. This report provides information on the materials and substrates that were tested and the results. A copy of the report is included in the Information Handout.

The results of the asbestos survey conducted at Camp Connell, Peddler Hill and Woodfords Maintenance Stations are contained in the report Limited Asbestos and Deteriorated Lead-Containing Paint Survey Report, PROJECT NO. S9525-01-79, June 2013, prepared by Geocon Consultants, Inc. This report provides information on the materials and substrates that were tested and the results. A copy of the report is included in the Information Handout.

Notify the Engineer immediately if any of the following occur:

Construction activities, other than those already described in the construction work plan, will or may disturb asbestos identified in the asbestos survey report.

Asbestos containing material (ACM), asbestos containing construction material (ACCM), or presumed asbestos containing material (PACM), not previously identified in the asbestos survey report, is discovered during construction activities.

99-02080A(2) Definitions

Regulations: All Federal, State, and local codes, regulations, laws, and requirements.

99-02080A(3) Submittals

If required for this project, submit copies of your:

1. Asbestos Certification, issued by the California State License Board
2. DOSH registration number, issued by the California Division of Occupational Safety and Health

Baseline Study and Clearance Inspection Report:

Submit baseline study, including analytical test results, before performing any asbestos related work. Allow 3 days for review and authorization.

Submit clearance inspection report, including analytical test results, at the conclusion of all asbestos related work.

Work Plans:

1. For construction work that will involve the disturbance or removal of asbestos, submit a construction work plan that includes:
   - 1.1. Schedule, phasing, description, and location of activities that involve the disturbance or removal of asbestos. Include starting and completion dates.
   - 1.2. Summary of techniques to be used for complying with the regulations
   - 1.3. Methods for complying with the requirements in "Methods of compliance" under 8 CA Code of Regs § 1529.
   - 1.4. Medical surveillance program under 8 CA Code of Regs § 1529, or certify that one is not required
   - 1.5. Respiratory protection program under 8 CA Code of Regs § 5144, or certify that one is not required
   - 1.6. Personnel monitoring procedures
   - 1.7. Documentation of required employee training, including required medical examinations, respirator fit test records, and certifications, for all individuals who will perform this work
   - 1.8. Standard procedures for protecting other workers, visitors, and any Department personnel at the jobsite, and for protection of spaces outside the work area from contamination
   - 1.9. Methods for any required protection of heating, ventilation, or air conditioning systems
   - 1.10. Locations of required signage and hygiene facilities
   - 1.11. Federal, State, and local agencies that require notification
   - 1.12. Identification of responsible parties and emergency contacts
   - 1.13. Names, addresses, phone numbers, and certifications for the analytical laboratory, waste transport firm, and disposal facility to be used
   - 1.14. Worker roster, including name, address, and telephone number of each worker, who will be used for each phase or location of work
   - 1.15. Contractor and worker qualifications
   - 1.16. Name, address, and telephone of subcontractors who will perform this work
   - 1.17. Methods for performing the perimeter area air monitoring required by this specification
   - 1.18. Final clearance inspection criteria

   Submit the construction work plan to the Engineer before performing any asbestos related work. Allow 5 days for review and authorization.

   Correct any rejected construction work plan and resubmit a corrected plan within 5 days of notification by the Engineer, at which time a new review period of 5 days will begin.

   Do not perform any asbestos related work until the construction work plan has been authorized by the Engineer. The Engineer's review and authorization does not waive any contract requirements and does not relieve you from complying with the regulations.

2. For asbestos containing waste that is a hazardous waste, submit a hazardous waste work plan that includes:
   - 2.1. Summary of methods and techniques to be used for complying with the regulations for handling, packaging, storing, transporting, and disposing of the hazardous waste
   - 2.2. Contractor and worker qualifications
   - 2.3. Name, address, phone number, U.S. EPA identification number, and DTSC Registered Hazardous Waste Transporters registration number for the waste transport firm. Include method of transportation
   - 2.4. Name, address, phone number, certification, U.S. EPA identification number, and class of the disposal facility to be used
   - 2.5. Proposed job site location to be used for storing any hazardous waste containers

   Submit the hazardous waste work plan to the Engineer before handling, packaging, storing, transporting, or disposing of any hazardous waste. Allow 3 days for review and authorization.

Correct any rejected hazardous waste work plan and resubmit a corrected plan within 2 days of notification by the Engineer, at which time a new review period of 3 days will begin.

Do not store, transport, or dispose of any hazardous waste until the hazardous waste work plan has been authorized by the Engineer. The Engineer's review and authorization does not waive any contract requirements and does not relieve you from complying with the regulations.

Worker Roster: An updated worker roster must be submitted and authorized before any worker, not on the current roster, performs any work. Allow 3 days for review and authorization.

Notifications: Submit copies of all notifications required by the regulations.

U.S. Environmental Protection Agency Identification Number Request: If required, submit a request for the U.S. EPA ID number.

Hazardous Waste Manifest: If required, submit a copy of the hazardous waste manifest for each shipment of hazardous waste.

Disposal Documentation: Submit documentation from disposal facility indicating proper disposal of all hazardous waste and nonhazardous asbestos containing waste, within 5 days of transporting the waste from the job site.

Perimeter Area Air Monitoring and Perimeter Area Surveillance Results: Submit copies of all perimeter area air monitoring and perimeter area surveillance results within 24 hours of receiving the analytical test results.

Department Clearance Inspection: Submit request for Department clearance inspection.

At the conclusion of asbestos related work, submit a statement that the work has been performed under the regulations and these special provisions.

Final Records:

Submit copies of final records indicating that the asbestos related work has been performed under the regulations and these special provisions, including:

1. Records of any worker protection monitoring performed.
2. Records required to be maintained by CA Code of Regs § 1529, subsection (n), including any:
   2.1. Objective data relied on for CA Code of Regs § 1529, subsections (f) and (n).
   2.2. Exposure measurements.
   2.3. Medical surveillance.
   2.4. Training records.
   2.5. Data to rebut PACM.
   2.6. Record of required notifications.
3. Daily progress logs.
4. List of workers who performed any asbestos related work. Include name and any required certifications for each worker.
5. Permits and approvals obtained.

Asbestos Training: Submit descriptive information for the asbestos training.

99-02080A(4) Quality Control and Assurance

Follow all regulations, including:

Federal:

1. 40 CFR 61, Subpart M_National Emission Standard for Asbestos (NESHAP)
2. 40 CFR 763, Asbestos (AHERA)

State:

1. 8 CA Code of Regs § 1529. Asbestos.
2. 8 CA Code of Regs § 5144. Respiratory Protection

3. 14 CA Code of Regs, Chapter 3.5. Standards For Handling And Disposal Of Asbestos Containing Waste
4. 22 CA Code of Regs, Division 4.5. Environmental Health Standards For The Management Of Hazardous Waste

Local:

1. Follow all local regulations applicable to the project location.

Qualifications:

All work must be performed by competent persons trained, knowledgeable, qualified, and certified in asbestos related work, including removal, demolition, handling, and disposal.

All analytical testing must be performed by an analytical laboratory certified by the National Voluntary Laboratory Accreditation Program (NVLAP) or the American Industrial Hygiene Association (AIHA).

Firms to be used for performing baseline study, perimeter area surveillance, perimeter area air monitoring, and clearance testing, including all sample analysis, must not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for this project.

The following items must be prepared, signed, and stamped by a certified asbestos consultant, currently certified by the California Division of Occupational Safety and Health:

1. Baseline study
2. Construction work plan
3. Hazardous waste work plan, if required
4. All perimeter area air monitoring and perimeter area surveillance results
5. Clearance inspection report

Asbestos Training: You must provide asbestos training, complying with the training requirements for a competent person in 8 CA Code of Regs § 1529, for a maximum of 4 Department personnel. The training must be a minimum of 40 hours.

Preconstruction Meeting:

Before performing any asbestos related work, attend a preconstruction meeting with your subcontractors and their competent person, key personnel, and field supervisors, who will be performing or overseeing the work. Be prepared to discuss the following topics and documents:

1. Submittals, including the authorized construction work plan and the authorized hazardous waste work plan, if required
2. “Field Quality Control” requirements specified below

The Engineer will determine the time and location of the meeting.

99-02080B Materials

Not Used

99-02080C Construction

99-02080C(1) General

Notify the Engineer at least 15 days before performing any asbestos related work.

Perform asbestos related work under the authorized construction work plan and the hazardous waste work plan, if required.

Only workers listed on the roster in the authorized work plans must be used to perform the work.

Minimize disturbance of asbestos that is to remain in place.

99-02080C(2) Asbestos Containing Waste

Handle, package, store, transport, and dispose of all asbestos containing waste under the regulations. Apply the most stringent requirements if there is a conflict or overlap of requirements.

Nonhazardous Asbestos Containing Waste: If the asbestos containing waste is a nonhazardous waste, dispose of the waste at an appropriately permitted disposal facility under section 10-2.02B.

Hazardous Waste: If the asbestos containing waste is a hazardous waste, comply with the following additional requirements:

1. In addition to the labeling and marking requirements in 22 CA Code of Regs §§ 66262.31 and 66262.32, mark labels with:
   1.1. Date the hazardous waste was generated.
   1.2. Composition and physical state of the hazardous waste.
   1.3. Contractor or subcontractor name.
   1.4. Contract number.
   1.5. Name, address, and telephone number of the Engineer.
2. If containers are stored within the job site limits, store them in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the job site limits.
3. Dispose of the waste at an appropriately permitted hazardous waste disposal facility, located in California, under the requirements of the disposal facility operator, within 30 days.
4. The Engineer will obtain the U.S. EPA ID number and will sign all manifests as the generator, within 2 days of receiving your request for the number.

99-02080C(3) Field Quality Control

Critical barriers, or other barrier or isolation methods that are used in performing the asbestos related work, must not be removed until satisfactory results are obtained from both the clearance inspection report and the Department's clearance inspection.

Baseline Study:

Before performing any asbestos related work prepare a baseline study, consisting of a visual examination, aggressive air sampling, and analytical test results, to determine the initial conditions in the area where the asbestos related work will be performed.

Visual examination must comply with the requirements of ASTM E1368.

Take 5 aggressive air samples at the locations determined by your certified asbestos consultant and authorized by the Engineer.

Analyze the air samples by transmission electron microscopy (TEM), and comply with the requirements of 40 CFR Part 763, Appendix A, Subpart E.

Perimeter Area Air Monitoring and Perimeter Area Surveillance:

When critical barriers or other barrier or isolation methods are used, perimeter area air monitoring and perimeter area surveillance must be conducted on the initial day of asbestos disturbance or removal activities.

When critical barriers or other barrier or isolation methods are not used, perimeter area air monitoring and perimeter area surveillance must be conducted on the initial day of asbestos disturbance or removal activities, and every day thereafter these activities are performed, until the conclusion of these activities.

Perimeter area air monitoring and perimeter area surveillance must comply with the requirements of 8 CA Code of Regs § 1529.

Any deficiencies discovered by perimeter area air monitoring or perimeter area surveillance must be corrected immediately.

Clearance Inspection Report:

At the conclusion of asbestos related work prepare a clearance inspection report, consisting of a visual examination, aggressive air sampling, and analytical test results, to determine the final conditions in the area where the asbestos related work was performed.

Visual examination must comply with the requirements of ASTM E1368.

Take 5 aggressive air samples at the same locations where samples were taken in the baseline study.

Analyze the air samples by transmission electron microscopy (TEM), and comply with the requirements of 40 CFR Part 763, Appendix A, Subpart E.

The visual examination for the clearance inspection report must show that final conditions, in the area where the asbestos related work was performed, are equal to or better than the initial conditions.

The asbestos fiber concentrations from the air samples taken for the clearance inspection report must be less than or equal to those in the baseline study.

Department Inspections:

The Department may conduct perimeter area air monitoring or perimeter area surveillance when you are performing asbestos disturbance or removal activities.

At the conclusion of asbestos related work, the Department will perform a clearance inspection. The inspection will include a visual inspection, and aggressive air clearance sampling, if applicable.

Submit a request for a Department clearance inspection once you have completed the asbestos related work. Allow the Engineer at least 2 days to perform the inspection and provide the results.

99-02080D Payment

Not Used

99-02082 LEAD RELATED CONSTRUCTION WORK

99-02082A General

99-02082A(1) Summary

This section includes specifications for lead related construction work.

If lead containing materials (LCM) will be disturbed in order to perform the work for this project, any disturbance of LCM must comply with the regulations. Apply the most stringent requirements if there is a conflict or overlap of requirements.

The results of the LCM survey conducted at Pine Grove Maintenance Station are contained in the report Asbestos and Lead-Containing Paint Survey Report, PROJECT NO. S9525-01-60, February 2013, prepared by Geocon Consultants, Inc. This report provides information on the materials and substrates that were tested and the results. A copy of the report is included in the Information Handout.

The results of the LCM survey conducted at Camp Connell, Peddler Hill and Woodfords Maintenance Stations are contained in the report Limited Asbestos and Deteriorated Lead-Containing Paint Survey Report, PROJECT NO. S9525-01-79, June 2013, prepared by Geocon Consultants, Inc. This report provides information on the materials and substrates that were tested and the results. A copy of the report is included in the Information Handout.

Notify the Engineer immediately if any of the following occur:

1. Construction activities, other than those already described in the construction work plan, will or may disturb LCM identified in the LCM survey report.
2. LCM, not previously identified in the LCM survey report, are discovered during construction activities.

99-02082A(2) Definitions

Regulations: All Federal, State, and local codes, regulations, laws, and requirements.

99-02082A(3) Submittals

Baseline Study and Clearance Inspection Report:

Submit baseline study, including analytical test results, before performing any lead related construction work. Allow 3 days for review and authorization.

Submit clearance inspection report, including analytical test results, at the conclusion of all lead related construction work.

Work Plans:

1. For construction work that will disturb LCM, submit a construction work plan that includes:
   - 1.1. Schedule, phasing, description, and location of activities that will disturb LCM. Include starting and completion dates.
   - 1.2. Summary of techniques to be used for complying with the regulations
   - 1.3. Methods for complying with the requirements in "Methods of compliance" under 8 CA Code of Regs § 1532.1. Include a written compliance program.
   - 1.4. Medical surveillance program under 8 CA Code of Regs § 1532.1, or certify that one is not required
   - 1.5. Respiratory protection program under 8 CA Code of Regs § 5144, or certify that one is not required
   - 1.6. Personnel monitoring procedures
   - 1.7. Documentation of required employee training, including required medical examinations, respirator fit test records, and certifications, for all individuals who will perform this work
   - 1.8. Standard procedures for protecting other workers, visitors, and any Department personnel at the jobsite, and for protection of spaces outside the work area from contamination
   - 1.9. Sampling protocol and procedures for performing the waste analysis
   - 1.10. Qualifications of sampling personnel performing the waste analysis
   - 1.11. Methods for any required protection of heating, ventilation, or air conditioning systems
   - 1.12. Locations of required signage and hygiene facilities
   - 1.13. Federal, State, and local agencies that require notification
   - 1.14. Identification of responsible parties and emergency contacts
   - 1.15. Names, addresses, phone numbers, and certifications for the analytical laboratory, waste transport firm, and disposal facility to be used
   - 1.16. Worker roster, including name, address, and telephone number of each worker, who will be used for each phase or location of work
   - 1.17. Contractor and worker qualifications
   - 1.18. Name, address, and telephone of subcontractors who will perform this work
   - 1.19. Final clearance inspection criteria

   Submit the construction work plan to the Engineer before performing any lead related construction work. Allow 5 days for review and authorization.

   Correct any rejected construction work plan and resubmit a corrected plan within 5 days of notification by the Engineer, at which time a new review period of 5 days will begin.

   Do not perform any lead related construction work until the construction work plan has been authorized by the Engineer. The Engineer's review and authorization does not waive any contract requirements and does not relieve you from complying with the regulations.

2. For lead containing construction debris that is determined to be a hazardous waste, submit a hazardous waste work plan that includes:
   - 2.1. Summary of methods and techniques to be used for complying with the regulations for handling, packaging, storing, transporting, and disposing of the hazardous waste.
   - 2.2. Contractor and worker qualifications.
   - 2.3. Analytical results from the waste analysis, including sample types, sample locations, chain of custody documentation, and name of analytical laboratory.
   - 2.4. Name, address, phone number, U.S. EPA identification number, and DTSC Registered Hazardous Waste Transporters registration number for the waste transport firm. Include method of transportation.

2.5. Name, address, phone number, certification, U.S. EPA identification number, and class of the disposal facility to be used.
2.6. Proposed job site location to be used for storing any hazardous waste containers.

Submit the hazardous waste work plan to the Engineer before, packaging, storing, transporting, or disposing of any hazardous waste. Allow 3 days for review and authorization.

Correct any rejected hazardous waste work plan and resubmit a corrected plan within 2 days of notification by the Engineer, at which time a new review period of 3 days will begin.

Do not store, transport, or dispose of any hazardous waste until the hazardous waste work plan has been authorized by the Engineer. The Engineer's review and authorization does not waive any contract requirements and does not relieve you from complying with the regulations.

Worker Roster: An updated worker roster must be submitted and authorized before any worker, not on the current roster, performs any work. Allow 3 days for review and authorization.

Notifications: Submit copies of all notifications required by the regulations, except for employee notifications required by CA Code of Regs § 1532.1.

Analytical Test Results From Waste Analysis:

Submit analytical test results from the waste analysis, including sample types, sample locations, chain of custody documentation, and name of analytical laboratory. Allow 2 days for review and authorization before:

1. Requesting that the Engineer obtain an EPA ID number, if required
2. Requesting the Engineer's signature on the waste analysis requested by the disposal facility, if required
3. Removing any of the debris from the job site

U.S. Environmental Protection Agency Identification Number Request: If required, submit a request for the U.S. EPA ID number.

Hazardous Waste Manifest: If required, submit a copy of the hazardous waste manifest for each shipment of hazardous waste.

Disposal Documentation: Submit documentation from disposal facility indicating proper disposal of all hazardous waste and nonhazardous lead containing construction debris, within 5 days of transporting the debris from the job site.

At the conclusion of lead related construction work, submit a statement that the work has been performed under the regulations and these special provisions.

Final Records:

Submit copies of final records indicating that the lead related construction work has been performed under the regulations and these special provisions, including:

1. Records of any worker protection monitoring performed
2. Records required to be maintained by CA Code of Regs § 1532.1, subsection (n), including any:
   2.1. Exposure assessment
   2.2. Medical surveillance
   2.3. Medical removals
   2.4. "Objective data for exemption from requirement for initial monitoring"
3. Daily progress logs
4. List of workers who performed any lead related construction work. Include name and any required certifications for each worker.
5. Permits and approvals obtained

Lead Awareness Training: Submit descriptive information for the contents of the lead awareness training.

99-02082A(4) Quality Control and Assurance

Follow all regulations, including:

Federal:

1. 29 CFR 1926.62

State:

1. 8 CA Code of Regs § 1532.1. Lead
2. 8 CA Code of Regs § 5144. Respiratory Protection
3. 17 CA Code of Regs
4. 22 CA Code of Regs, Division 4.5. Environmental Health Standards For The Management Of Hazardous Waste

Local:

1. Follow all local regulations applicable to the project location.

Qualifications:

All work must be performed by competent persons trained, knowledgeable, qualified, and certified in lead related construction work, including removal, demolition, handling, and disposal.

All analytical testing must be performed by an analytical laboratory certified by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program.

The following items must be prepared, signed, and stamped by a lead professional currently certified by the CDPH Lead-Related Construction Program:

1. Baseline study
2. Construction work plan
3. Hazardous waste work plan, if required
4. Written compliance program
5. Clearance inspection report

Lead Awareness Training: You must provide 8 hours of lead awareness training, complying with the provisions in 8 CA Code of Regs § 1532.1. Lead and 8 CA Code of Regs § 5194. Hazard Communication, for a maximum of 4 Department personnel.

Preconstruction Meeting:

Before performing any lead related construction work, attend a preconstruction meeting with your subcontractors and their competent person, key personnel, and field supervisors, who will be performing or overseeing the work. Be prepared to discuss the following topics and documents:

1. Submittals, including the authorized construction work plan and the authorized hazardous waste work plan, if required
2. “Field Quality Control” requirements specified below

The Engineer will determine the time and location of the meeting.

99-02082B Materials

Not Used

99-02082C Construction

99-02082C(1) General

Notify the Engineer at least 15 days before performing any lead related construction work.

Perform lead related construction work under the authorized construction work plan and the hazardous waste work plan, if required.

Only workers listed on the roster in the authorized work plans must be used to perform the work.

Minimize disturbance of LCM that are to remain in place.

99-02082C(2) Lead Containing Construction Debris

Sample, analyze, handle, package, store, transport, and dispose of all lead containing construction debris under the regulations. Apply the most stringent requirements if there is a conflict or overlap of requirements.

Waste Analysis: A waste analysis for lead must be performed on the lead containing construction debris as required by the regulations and the disposal facility.

Nonhazardous Lead Containing Construction Debris: If the results of the waste analysis demonstrate that the lead containing construction debris is a nonhazardous waste and the Engineer authorizes the results, dispose of the debris at an appropriately permitted disposal facility under section 10-2.02B.

Hazardous Waste: If the results of the waste analysis demonstrate that the lead containing construction debris is a hazardous waste, comply with the following additional requirements:

1. In addition to the labeling and marking requirements in 22 CA Code of Regs §§ 66262.31 and 66262.32, mark labels with:
   - 1.1. Date the hazardous waste was generated
   - 1.2. Composition and physical state of the hazardous waste
   - 1.3. Contractor or subcontractor name
   - 1.3. Contract number
   - 1.4. Name, address, and telephone number of the Engineer
2. If containers are stored within the job site limits, store them in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the job site limits.
3. After the Engineer authorizes the analytical test results, dispose of the waste at an appropriately permitted hazardous waste disposal facility, located in California, under the requirements of the disposal facility operator, within 30 days of authorization.
4. The Engineer will obtain the U.S. EPA ID number and will sign all manifests as the generator, within 2 days of receiving and authorizing the analytical test results and your request for the number.

99-02082C(3) Field Quality Control

Baseline Study:

Before performing any lead related construction work prepare a baseline study consisting of analytical test results, to determine the initial lead concentrations on surfaces in the area where the work will be performed.

You will be required to take and analyze soil samples and dust samples. The Engineer will determine location of all samples.

Soil and dust sampling and analysis must comply with the following requirements:

Material	Sampling	Analysis
Soil	ASTM E1727	ASTM E1613, EPA Method 6010B, EPA Method 6020, or EPA Method 7420
Dust (Wipe)	ASTM E1728 or NIOSH 9100	ASTM E1613, NIOSH 7082, EPA Method 6010B, or EPA Method 7420
Dust (Vacuum)	ASTM D7144 or ASTM D5438	ASTM E1613, NIOSH 7082, EPA Method 6010B, or EPA Method 7420

Clearance Inspection Report:

At the conclusion of lead related construction work prepare a clearance inspection report, consisting of analytical test results, to determine the final conditions in the area where the lead related construction work was performed.

You will be required to take the same number and type of samples and at the same locations, that were taken in the baseline study.

Soil and dust sampling and analysis must comply with the requirements of "Baseline Study" specified above.

The lead concentrations of the samples taken for the clearance inspection report must be less than or equal to those in the baseline study.

Department Inspections: At the conclusion of lead related construction work, the Department may perform a clearance inspection. The inspection will include 1) a visual inspection, and 2) sampling and analysis of soil samples, or dust samples, or a combination of both soil and dust samples, if applicable.

99-02082D Payment

Not Used

99-02110 CLEARING AND GRUBBING

99-02110A General

99-02110A(1) Summary

Scope: This work consists of removing all objectionable material from the building site.

Clearing and grubbing must be performed in advance of any other grading or construction operations.

The area to be cleared and grubbed must be within the building work construction area.

99-02110A(2) Definitions

Not Used

99-02110A(3) Submittals

Not Used

99-02110A(4) Quality Control and Assurance

99-02110A(5) Site Conditions

Traffic: Clearing and grubbing must be conducted to ensure minimum interference with roads, street, walks, or other occupied areas.

Protection of Existing Landscaping and Trees: Existing landscaping and trees which are to remain in place must be protected from injury or damage. Existing trees must be protected with a temporary fence around the drip line.

99-02110B Materials

Not Used

99-02110C Construction

99-02110C(1) Site Clearing

Remove trees, shrubs, grass, and other vegetation, concrete and masonry, improvements, or obstructions interfering with the new construction.

Trees to be removed must be grubbed to a depth of not less than 2 feet below finished grade.

99-02110C(2) Removal of Waste Material

Hauling: When hauling is done over highways or city streets, and when directed by the Engineer, the loads must be trimmed and all material removed from shelf areas of the vehicles.

Disposal: Trees, shrubs, grass, weeds and other vegetation, debris, and any obstructions above or below the ground surface that interfere with the building work, must be removed and disposed of.

99-02110D Payment

Not Used

99-02210 ROUGH GRADING

99-02210A General

99-02210A(1) Summary

Scope: This work consists of rough grading the job site.

Rough grading consists of excavation or removal of above grade material regardless of character and subsurface condition; filling of all holes, swales, embankments, and low points to the elevation shown or described; and the preparation of basement material for the placing of other material thereon and the establishment of the grading plane.

99-02210A(2) Definitions

Not Used

99-02210A(3) Submittals

Not Used

99-02210A(4) Quality Control and Assurance

Not Used

99-02210B Materials

Fill Material:

> Material from the excavation that is suitable for the required compaction may be used for filling holes, swales and low points. Fill material must be free of organic material. Rocks and lumps must be well distributed with sufficient earth or other fine matrix material to produce a dense, compacted fill that is suitable for the construction and load support intended.
>
> The Contractor must furnish suitable borrow material to offset any material deficiencies developed from grading work.

99-02210C Construction

99-02210C(1) Excavation

Care must be exercised to avoid disturbing material below and beyond the limits of excavation. When excavation is carried beyond the limits shown or described such excavation must be replaced in kind and compacted at the Contractor's expense.

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 the Contractor's expense.

Excess and waste materials from the excavation becomes the property of the Contractor and be disposed of.

99-02210C(2) Fill

Subgrade Preparation: Preparation of subgrade material for placing other material thereon must include fine grading, compaction, reworking as necessary, and preparation of cut, or fill upon which base materials, surfacing, or slabs are to be placed. The upper 8 inches of the subgrade must have the same compaction as the fill to be placed over it.

Placing: When footings are to be constructed in fill, the fill must be constructed to the grading plane required for the building construction prior to excavating for the footings. Fill must be placed and compacted in layers. The loose thickness of each layer before compaction must not exceed 6 inches.

Water must be added to the fill material as needed for compaction.

99-02210C(3) Compaction

Relative compaction must be determined under California Test 216 or 231. 22

Relative Compaction (95 percent):

> In fill relative compaction of not less than 95 percent must be obtained for a minimum depth of 2.5 feet below finished grade for the width of the paved areas plus 3 feet on each side thereof.
>
> The prism of fill directly underneath the building foundation and sloping downward at 1:1 must be compacted to 95 percent.

Relative Compaction (90 percent): Relative compaction of not less than 90 percent must be obtained in all fill except as specified above.

99-02210C(4) Field Quality Control

Testing and Inspection: The State will conduct compaction tests during the earthwork operations.

99-02210D 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 must include excavation for footings, foundations, walls, slabs, tanks, drywells, manholes, oil/water separators, clarifiers, and trenches. Structure backfill must include backfilling under slabs; backfilling under and around footings; backfilling for walls, backfilling for pipes and conduits; backfilling holes resulting from removal of existing facilities. In addition to structure excavation and structure backfill, earthwork for building work must include any other earthwork, not mentioned, but necessary to complete the building work.

The Materials Information Handout includes information regarding foundation recommendations and reports that were prepared for use during the design of this project.

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, the Contractor 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 the Contractor's 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 must be classified as structure excavation.

Footing Excavation:

The bottom of excavation must not be disturbed. The Contractor 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 ±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 the Contractor's expense.

Overdepth excavation for footings must be backfilled with concrete or such other material recommended by the Contractor 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 Control

Inspection: When the excavation is substantially completed to grade, the Contractor 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

99-02372 CAST-IN-DRILLED-HOLE CONCRETE PILES

99-02372A General

99-02372A(1) Summary

Scope: This work consists of constructing cast-in-drilled-hole concrete piles.

99-02372A(2) Definitions

Not Used

99-02372A(3) Submittals

Not Used

99-02372A(4) Quality Control and Assurance

Not Used

99-02372B Materials

Concrete and Reinforcement: Concrete and reinforcement must comply with section 99-03300.

99-02372C Construction

Drilling Holes:

All holes for concrete piles must be drilled to the tip elevations or depths shown. All holes must be examined for straightness and any hole which on visual inspection from the top shows less than 1/2 the diameter of the hole at the bottom of the hole must be rejected. Suitable casings must be furnished and placed when required to prevent caving of the hole.

All loose material existing at the bottom of the hole after drilling operations have been completed must be removed before placing concrete in the hole.

Material resulting from drilling holes must be wasted on the job site as directed by the Engineer.

Surface water must not be permitted to enter the hole and all water which may have infiltrated into the hole must be removed before placing concrete therein.

Placing Reinforcement:

The reinforcing cage must be placed and secured symmetrically about the center of the pile and must be securely blocked to clear the sides of the hole.

Longitudinal reinforcing steel must be continuous for the entire length of pile, including pile extensions.

Placing Concrete:

The concrete filling must be vibrated to a dense and homogeneous condition. Concrete placed in drilled holes must be placed against undisturbed material except when portions of the pile will be exposed to view. Surfaces exposed to view and adjacent surfaces within 10 inches of finished grade must be formed.

Casing, if used in drilling operations, must be removed from the hole as concrete is placed therein. The bottom of the casing must be maintained not more than 5 feet nor less than one foot below the top of the concrete during withdrawal and placing operations, unless otherwise authorized by the Engineer. Separation of the concrete during withdrawal operations must be avoided by hammering or otherwise vibrating the casing.

Formed surfaces must comply with section 99-03300.

99-02372D Payment

Not Used

99-02729 INFILTRATION CHAMBERS

99-02729A General

99-02729A(1) Summary

Scope: This work consists of installing infiltration chambers and appurtenances.

Related work:

Pipes, fittings, valve boxes, and similar equipment must comply with section 99-02750.

Excavation, trenching, and backfill must comply with section 99-02220. Grading for the 1 1/2" to 2" crushed stone to be per the infiltration chamber manufacturer.

Filter fabric must comply with section 99-02734.

Geogrid must comply with section 99-02735.

99-02729A(2) Definitions

Not Used

99-02729A(3) Submittals

Product Data: Product list for material to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standards of manufacturer.

Shop Drawings: Shop drawings for the infiltration chambers, pipes, and appurtenances used in the work must be submitted.

99-02729A(4) Quality Control and Assurance

Not Used

99-02729B Materials

99-02729B(1) Manufactured Units

Infiltration Chambers:

Infiltration chambers must be a sectional open bottom plastic leaching chamber. Chambers must be interlocking. Endplates must be same material and interlocking. Knockout and splash plate must be provided in endplate. One knockout in top of chamber must be provided for observation well. Infiltration sidewalls must be utilized.

Infiltration chamber must be rated for H-20 loading at buried depth.

Distribution Box:

Distribution box must be made of reinforced concrete. The distribution box must have 4-inch holes, the number of which is as shown, with pipe seals and bolted down covers for Schedule 40 PVC and flow control inserts made of PVC.

Observation Wells:

Observation wells shall be sewer pipe, SDR 35, conforming to ASTM D 3034; or plastic drain, waste, and vent pipe, conforming to ASTM D 2665, perforated as shown on the plans, and terminating with an appropriately sized flexible PVC access cap.

99-02729C Construction

99-02729C(1) Installation

Install infiltration chambers in dry weather. The excavation must not commence until the soil moisture condition is dry to a depth of 2 inches as defined in the following definition from Table 3, "Criteria for Describing Moisture Condition," in ASTM: D 2488: "Absence of moisture, dusty, dry to the touch."

The trenches must be prepared by carefully raking sidewalls and the bottom to remove any smeared or glazed soil surfaces. Loose material must be removed from the trench.

Infiltration chamber trenches must not remain exposed to the elements for more than one day after excavation. Open trenches must not be exposed to rainfall and other external sources of moisture.

A single layer of filter fabric and geogrid extending the full perimeter of the trench must be placed over the crushed stone and the infiltration chambers as recommended by the manufacturer and as shown for H-20 loading. All splices in the filter fabric and geogrid must have a 12-inch minimum overlap.

Infiltration chambers must be installed as shown and according to the manufacturer's instructions on native soil to the invert elevations shown and to flat grades established by accurate survey methods. Infiltration chamber must be within 1/4 inch of the required grade.

Place native backfill above the infiltration chambers. The backfill material must be mounded 6 inches above the trench. Backfill must not be compacted or driven over. Infiltration chamber backfill must be native material free of rocks greater than 2" in greatest dimension, vegetable matter, trash or other deleterious material.

99-02729D Payment

Not Used

99-02731 LIFT STATION

99-02731A General

99-02731(1) Summary

Scope: This work consists of furnishing and constructing a lift station.

Lift station consists of fiberglass reinforced basin, cast-in-place concrete top slab, bolted flanged aluminum cover, access door, vent pipe, ground rod, and other work as necessary for a complete installation.

Related work:

Pipes, fittings, manhole frames and covers, and similar equipment must comply with section 99-02750.

Excavation, trenching, and backfill must comply with section 99-02220.

Concrete and reinforcement must comply with the requirements for minor work specified under section 99-03300.

99-02731A(2) Submittals

Product data: Manufacturer's product data must be submitted for all manufactured materials and equipment. Manufacturer's product data must include catalog cuts, complete description, performance data, and installation instructions.

Working Drawings: Working drawings for lift station must be submitted for approval. Drawings must show elevations, size, and method of installation for each component used in the work.

99-02731A(3) Quality Control and Assurance

Certificates of Compliance: Certificates of Compliance must be furnished for fiberglass reinforced basin, in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications

Delivery, Storage, and Handling: Do not drop or impact the basin. Use chocks if stored horizontally. To move the basin, install lifting lugs, sling, or choker as recommended by manufacturer. Use of chains or cables is prohibited.

99-02731A(4) 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.

99-02731B Materials

Fiberglass Reinforced Basin:

Fiberglass reinforced basin must be manufactured from commercial grade polyester resin or vinyl ester resin with fiberglass reinforcements. The resin system must be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with wastewater collection systems. Materials must conform to ASTM D3753. No fillers or extenders must be used. The resin must be suitable for continuous immersion in sewage in the pH range of 3 to 11 and concentrations of hydrogen sulfide found in municipal sewer systems.

Reinforcing materials must be commercial E-glass in the form of a mat of continuous or chopped strands or roving fabric, with a coupling agent that provides a suitable bond between glass reinforcement and resin. If reinforcing materials are used on the surface exposed to the contained substance, they must be commercial grade chemical-resistant glass that will bond with the resin and leave a resin-rich surface.

If used,additives must be inert to the environment and basin construction.

Fiberglass reinforced basin must be not less than 72 inches in diameter and conform to the requirements in ASTM Designation: C 478 and D 3753. Basin must have a bolted flanged aluminum cover with access door providing a 30" x 48" clear opening.

Fiberglass reinforced basin base section must be integral with sidewalls. Base must extend to form an antiflotation flange to assist in anchoring the basin.

A pigment must be applied to the resin on the exterior surface of the basin as a UV inhibitor, for a minimum thickness of 0.125 inches.

The fiberglass reinforced bottom must be attached to the basin with fiberglass layup in accordance with ASTM D 3299.

The basin must have an internal sloped fillet at the bottom and wall interface. The fillet must be constructed of the same fiberglass material as the basin and must be integral with the basin. The fiberglass fillet must have a 1:1 slope and must be constructed so it does not interfere with the pump mounting in the basin.

Stub-outs for inlet, outlet, or discharge lines must be factory installed with fiberglass layup in conformance with ASTM D 3299.

The exterior surface must be smooth with no sharp projections.

The interior surface must be resin rich with no exposed fibers and no wrinkles of 1/8 inch or greater in depth.

The access door, vent pipe, pump guide rail, discharge pipe assembly, angles with eye bolts and hooks for support of transducer, pumps floats and electrical cables must be installed by the basin manufacturer's at their factory prior to shipping to the jobsite.

The pump discharge elbow must be bolted to a mounting bracket that is integral with the basin floor, use stainless steel expansion anchors.

Basin must be permanently marked with manufacturer's name or trademark, product number, total length, and nominal diameter.

The complete basin must have a dynamic load rating of not less than 16,000 ft-lbs when tested in accordance with ASTM D 3753. To establish this rating, the complete basin must not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and must not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

The basin must have a minimum pipe stiffness value as follows when flexural strength is tested in accordance with ASTM D 3753.

Length (feet)	Stiffness (F/ΔY, psi)
10-20	2.01
21-30	3.02
31-40	5.24

Compressive strength, flexural strength, and modulus of elasticity of the basin must be not less than the following values when tested in accordance with ASTM D 3753.

	In Hoop Direction	In Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus	0.8×10^6	0.7×10^6
Flexural Strength (psi)	26,000	4,500
Flexural Modulus:		
No ribs: 48", 60", 72"	1.4×10^6	0.7×10^6
With ribs: 96", 144"	0.7×10^6	0.7×10^6

Access Door:

Access door must be single or double leaf, 1/4-inch minimum extruded aluminum frame. Door must be aluminum diamond plate reinforced with aluminum stiffeners as required. Steel hinges must be bolted to underside and pivot on tension bars for easy opening. Door to withstand a load of not less than 150 pounds per square foot, open to 90 degrees and lock open in that position, and equipped with snap lock and removable handle. Door hardware must be corrosion resistant. Aluminum must be mill finish and bituminous coating must be applied to exterior of frame by manufacturer.

The clear door opening must conform to the requirements of the equipment manufacturer to permit installation and removal of the pumping station equipment.

Pump lifting cable, level transducer lifting cable, Angles, hooks and bolts for cable support must be stainless steel grade 316.

99-02731C Construction

Fiberglass reinforced basin must be installed in accordance to the manufacturer's instructions.

Install piping connections in accordance with manufacturer's instructions.

All joints and penetrations of the basin must be sealed watertight.

Testing:

Lift station must be hydrostatically tested after installation.

Inlets and outlets must be plugged and the basin filled a minimum of 1 feet above the upper most basin penetration.

No visible loss of water must occur after 24 hour test period.

Basin that do not meet the hydrostatic test must be repaired or replaced and retested until there are no leaks.

99-02731D Payment

Not Used

99-02734 FILTER FABRIC

99-02734A General

99-02734A(1) Summary

Scope: This work shall consist of installing filter fabric in conformance with the details shown on the plans and these special provisions.

99-02734A(2) Definitions

Not Used

99-02734A(3) Submittals

Product Data:

Product list for material to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standards of manufacturer.

Samples: Test results and a representative sample of the following products of size 12" by 12 used in the work must be submitted.

99-02734A(4) Quality Control and Assurance

Provide Certificate of Warranty issued by the filter fabric manufacturer. Manufacturer warranties will include but not be limited to repair or replace fails fabric that fail(s) in materials, workmanship or that deteriorate(s) under conditions of normal weather within specified warranty period. Deliver Certificate of Warranty to Engineer.

99-02734B Materials

99-02734B(1) General

Filter fabric is commercial quality, chemically stable, non-biodegradable, and resistant to ultraviolet degradation.

99-02734 (2) Manufactured Units

Filter fabric is nonwoven, needle punched permeable geotextile, fabricated from 100 percent polyester, 100 percent polypropylene or 100 percent combined polyester and polypropylene having properties as follows:

Property	Value	Test Designation
Average fabric weight, oz/yd²	4.0 oz/yd²	
Tensile strength, Pounds	105 ±15 lbs	ASTM D4632
Elongation, %	50%	ASTM D4632
Trapezoidal tear, Pounds	45 lbs	ASTM D 4533
Water flow rate, Gpm/ft²	140 gpm/ft²	ASTM D4491
Thickness, mils	60 mils	ASTM D1777 or D5199
Permittivity, sec⁻¹	2.0 sec⁻¹	ASTM D 4491
AOS U.S. sieve	#70 U.S. sieve	ASTM D 4751

Protect filter fabric in packaging during shipping, storage, and handling from abrasion and ultraviolet radiation.

99-02734C Construction

99-02734C(1) Installation

Filter fabric must be placed over the crushed stone and the infiltration chambers as recommended by the manufacturer for H-20 loading. All splices in the filter fabric must have a 12-inch minimum overlap.

99-02734D Payment

Not Used

99-02735 GEOGRID

99-02735A General

99-02735A(1) Summary

Scope: This work consists of installing geogrid.

99-02735A(2) Definitions

Not Used

99-02735A(3) Submittals

Product Data:

> Product list for material to be used must be submitted and must include a catalog cut, the name of the manufacturer and the source, model number, description, and standards of manufacturer.

Samples: Submit test results and a 12 by 12 inches representative sample of the products to be used in the work.

99-02735A(4) Quality Control and Assurance

Provide Certificate of Warranty issued by the geogrid manufacturer. Manufacturer warranties must include, but not limited to, repair or replace geogrid that fails in materials, workmanship or that deteriorates under normal conditions within specified warranty period. Deliver Certificate of Warranty to the Engineer.

99-02735B Materials

99-02735B(1) General

Geogrid is commercial quality, chemically stable, non-biodegradable, and resistant to ultraviolet degradation. Geogrid is a geosynthetic fabricated from 100 percent polypropylene having properties as follows:

Property	Value	Test Designation
Aperture Dimensions, in	1.0	ASTM D4759-02
Tensile strength, @ Ultimate lb/ft	850	ASTM D6637-01
Minimum rib thickness, in	0.03	ASTM D4759-02
Junction Efficiency, %	93	GRI-GG2-05
Flexural stiffness,mg-cm	250,000	ASTM D5732-01
Aperture Stability, m-N/deg	0.32	US Army COE Test Method

Protect geogrid in packaging during shipping, storage, and handling from abrasion and ultraviolet radiation.

99-02735C Construction

99-02735C(1) Installation

Geogrid must be placed over the crushed stone and the infiltration chambers as recommended by the manufacturer for H-20 loading. All splices in the geogrid must have a 12-inch minimum overlap.

99-02735D Payment

Not Used

99-02750 WASH WATER SYSTEM

99-02750A General

99-02750A(1) Summary

Scope: This work consists of installing and constructing a wash water system and modifying portions of existing water systems.

Wash water system must include other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Order of Work: Work which will curtail the use of the existing sewage system must not be done until the facilities utilizing the system are closed and are no longer required.

Related Work:

Concrete and reinforcement must comply with the requirements for minor work specified under Section 99-03300.

Excavation, trenching, and backfill must comply with section 99-02220.

Filter screen fabrication must comply with section 99-05500.

99-02750A(2) Definitions

Not Used

99-02750A(3) Submittals

Product Data:

Materials list for materials to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts to be submitted are as follows:

Underground tracer tape
Drain pipe and fittings
Vent pipe and fittings
Water pipe and fittings
Force main pipe and fittings
Union
Insulating union
Dielectric waterway
Sand-Oil separator (with sampling box)
Sludge sensing system
Manhole
Manhole frame and cover
Traffic frame and cover
Rectangular manhole cast iron cover
Galvanized checker plate manhole cover
Meter box
Valve box
Access box
Assist Access cover
Ball valve
True union ball valve
Check valve
Solenoid valve
Flow control valve
Cleanout to grade
Cleanout through floor
Hose faucet
Hose reel
Fiberglass grate and frame
Heat tape
Bituminous coating
Waterproof membrane
Cement mortar
Epoxy mortar
Sealant
Pipe wrapping tape
Pipe supports
Pipe hanger
Water hose water nozzle
Undercarriage spray nozzle

Certificates of Compliance: Submit a certificate of compliance for manufactured products.

99-02750A(4) Quality Control and Assurance

Codes and Standards: All wash water work must comply with the applicable portions of the California Plumbing Code, California Code of Regulations, Title 24, Part 5.

99-02750B Materials

99-02750B(1) Identification

Underground Tracer Tape: Underground tracer tape must be permanent, detectable, bright colored, continuous printed plastic tape intended for direct burial service; not less than 2 inches wide; lettering must read "CAUTION SEWER BURIED BELOW."

99-02750B(2) Pipes and Pipe Fittings

The Contractor must install pipes and fittings from the following materials, of the weight and class with the joining method as indicated.

Drain Pipe and Fittings: Drain pipe and fittings must be polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings complying with ASTM D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and spigot rubber gasketed joints or complying with ASTM D 2665 with solvent welded fittings. Rubber gaskets must comply with ASTM F 477. Stainless steel clamps with rubber boots must not be used.

Vent Pipe and Fittings:

> Vent pipe underground must be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 200 psi.
>
> Vent pipe risers above ground and below ground must be 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.

Water Pipe and Fittings:

> Water pipe underground must be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 200 psi.
>
> Water pipe risers above ground and below ground must be 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.

Force Main Pipe and Fittings: Force main pipe and fittings must be polyvinyl chloride (PVC) plastic pipe, Schedule 80, complying with ASTM D 1785. Connections may be threaded and/or glued unless otherwise shown.

Union: Unions (for steel pipe) must be 250 psi, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

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.

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).

99-02750B(3) Concrete Tanks

Sand-Oil separator (with Sampling Box): Sand-Oil separator (with sampling box) must be a precast reinforced concrete tank of the size shown. All joints must be at the top of the tank above the normal operating water level. Sampling box must be the depth shown and supplied by the sand-oil separator manufacturer. The sand-oil separator must be listed and approved by the International Association of Plumbing and Mechanical Officials (IAPMO) and tank must be marked accordingly.

Sludge sensing system: Sludge sensing system consists of controller and underwater ultrasonic acoustic sensor for detecting sludge thickness inside tank. The sensor must have 4-20mA output, 120-volt AC, PVC enclosure, epoxy coating, and shielded twin pair connection to the controller. The controller must have NEMA 4X enclosure, cable length suitable for installation and display with minimum of four formats. Relays must be UL approved and with 10A switching capacity at 120-volt AC.

99-02750B(4) Manholes and Covers

Manhole: Manhole riser sections and cones and grade rings must be precast, reinforced concrete, complying with ASTM C 478 or precast reinforced concrete pipe complying with ASTM C 76.

Manhole Frame and Cover: Manhole frame and cover must be gray cast iron complying with ASTM A 48, Class 30B or greater (traffic type). Cover must be no bolt, closed pick hole and must be factory marked "SS," "SEWER," or "SANITARY SEWER." The bearing surfaces of frames and covers must be machined grooved for an integral O-ring gasket. The frame seat for the bottom O-ring gasket must be a minimum of 7/8 inch in width.

Traffic Frame and Cover: Traffic frame and cover must be square, heavy duty type manhole with bottom flanged frame and solid cover. Frame and cover must be asphalt coated, ductile iron castings complying with ASTM A 536, Grade 60-40-18. Cover must have lifting handles and 2 corrosion resistant, countersunk bolts located in opposite sides of the cover.

Rectangular Manhole Cast Iron Cover: Rectangular manhole cast iron cover and must be gray cast iron complying with ASTM A 48, Class 30B or greater (traffic type). Cover must be no bolt, closed pick hole and must be factory marked "SS," "SEWER," or "SANITARY SEWER." Rectangular manhole covers must comply with the dimensions as shown. The bearing surfaces of frames and covers must be machined, and the cover must seat firmly into the frame without rocking or sliding. A flat gasket must be installed and bonded to the frame seat with contact cement.

99-02750B(5) Meter, Valve, and Access Box

Meter Box: Meter box must be precast concrete with cast iron cover. Cover must be factory marked "SEWER," "SS," or "SANITARY SEWER", and must be traffic rated. Meter box must be Bes, No. C9W with C15 cover; Christy, No. B9 with B9C cover; Cook Concrete Products, No. 14 with 14-T cover; or equal.

Valve Box: Valve box must be precast concrete and cast iron cover with no holes. Cover must be traffic rated, factory marked "SEWER," "SS," or "SANITARY SEWER," or "WATER," as required. Valve box must be Cook Concrete Products, Christy Concrete Products, Bes Concrete products, or equal with extensions as required.

Access Box: Access box must be watertight, precast concrete box and cast iron cover or galvanized checker plate manhole cover. Cover must be traffic rated, factory marked "SEWER," "SS," or "SANITARY SEWER." Access box must be any combination of Bes Concrete Products, Christy Concrete Products, Cook Concrete Products, M.C. Nottingham, Neenah Castings, or equal with extensions as required by plan dimension.

Assist Access Cover:

The assist access cover must be H-20 rated, single leaf, hinged with heavy duty pneumatic and/or spring assist for end user lifting force of 25 pounds. The cover and frame must be constructed of 6061-T6 aluminum for bars, angle and extrusions. Diamond cover plate may be 5086 aluminum, minimum 1/4 inch thick. Aluminum must be mill finish. Exterior of frame must have a minimum of one coat of bituminous paint.

The cover must be equipped with a stainless steel lift handle and recessed lock. Lift handles must be flush with top of diamond plate. The cover must be equipped with an aluminum hold open arm. Cover must lock open in the 90 degree position. The hold open arm must be fastened to the frame with a 1/2-inch grade 316 stainless steel bolt.

Hinges must be heavy duty brass alloy. Each hinge must have a 3/8-inch grade 316 stainless steel pin. Hinges must be bolted to the angle frame and diamond plate with 316 stainless steel bolts and Ny-Lock nuts.

99-02750B(6) Valves

Ball Valve: Ball valve must be two piece, minimum 400 psi WOG, bronze body and chrome plated or brass ball with full size port. Valve must be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

True Union Ball Valve: True union ball valve must be minimum 225 psi, polyvinyl chloride (PVC) body ball and components, fluorocarbon rubber o-rings, polytetrafluorolethylene (PTFE) seals, true union, factory mounted flanged, true block valve. Valves 4 inches or larger must be supplied with 2-inch square operating nut. Valve must be Hayward, Asahi, or equal.

Check Valve: Check valve must be polyvinyl chloride (PVC), swing check, socket by socket, full flow design, nonmetallic parts, designed for vertical usage, pressure rated to 125 psi, Buna-N seal and shielded clapper.

Solenoid Valve: Solenoid valves must be Type 1, General Purpose, 120-volt, 60-hertz, seal and discs of PTFE, CSA certified, UL listed. The water operating pressure differential must be 0 to 300 psi. Solenoid valve must be continuous duty cycle rated.

Flow Control Valve: Flow control valve must be automatic, accurate within ±5 percent, over a pressure differential of 8 psi to 125 psi, chlorinated polyvinyl chloride (CPVC) Type 1 body, rated for 400 psi minimum, stainless steel internal parts, rated for 212°F, sized as shown, threaded connections with internal stainless steel spring. Flow rate must be set by the manufacturer at 8 gallons per minute.

99-02750B(7) Cleanouts

Cleanout to Grade: Cleanout piping must terminate with an appropriately sized flexible PVC access cap and stainless steel band coupler with hex tightening screw. Rubber coupling or cap will not be allowed. Access cap must be Indiana Seal; Fernco; or equal.

Cleanout through Floor: Cleanout through floor must have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a vapor barrier, access frame must be provided with membrane clamping flange. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

99-02750B(8) Hydrants

Hose Faucet: Hose faucet must be compression type, angle pattern, wall flange at exterior locations, tee handle, 5/8-inch female thread with hose end, rough chrome or nickel plated 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, No. 63VB; Chicago, No. 13T; or equal.

Hose Reel: Hose reel must be heavy duty assembly of steel construction with connecting hose, locking automatic ratchet, guide rollers and heavy duty spring activated hose pickup. Hose reel must have bushings, swivels, ball stops, and sized for a 1-1/2 inch diameter by 50-foot delivery hose with a fire hose nozzle. The reel must have a baked enamel finish. Manufacturers reel mounting brackets must be supplied with reel.

99-02750B(9) Coatings

Bituminous coating: Bituminous coating must comply with ASTM D 41 and D 449.

99-02750B(10) Miscellaneous Materials

Fiberglass Grate and Frame:

Fiberglass grate must be traffic rated for installed width at maximum load, constructed of fiberglass roving reinforced thermoset plastic produced in a one-piece mold, or poltruded. Color must be green or light gray and have an anti slip molded finish. Fiberglass grate must be Fibergrate, Strongwell or equal.

Frame must be continuous each side; traffic rated as installed, galvanized steel angle iron, or fiberglass. Frame must be depth as required by supplied grate. Width must be as shown; fiberglass frame must be factory finished to the proper width. Frame must have 6-inch anchors on 3-foot centers. Fiberglass frame must be supplied by the grate manufacturer.

Heat tape: Heat tape must be 120-volt, self-regulating type heating cable with at least 30 watts per meter output and maximum maintenance temperature of 150 degrees F. Heating cable must be suitable for outdoor use and with a built-in thermostat for temperature control.

Cement Mortar: Cement mortar must consist of one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

Epoxy Mortar: Epoxy mortar must be commercial quality, low viscosity paste polysulfide extended epoxy formulated primarily for use in bonding new portland cement concrete to old portland cement concrete.

Sealant: Sealant for precast concrete tank must be closed cell expanded neoprene complying with ASTM D 1056, Grade RE 41.

Pipe Wrapping Tape:

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.

Pipe Supports: Pipe supports must consist of non-metallic or metallic construction channel.

Pipe Hanger (for Piping Supported from Overhead): Pipe hanger (for piping supported from overhead) must be Grinnell, Model N0. 269; Super Struct, Model No. C711; or equal.

Water Hoses: Water hoses must be 3/4-inch diameter by 100-foot length and 1-1/2 inch diameter by 50-foot length commercial duty rubber hose, industrial 2-layer tire cord reinforcing, resistant to oil, chemicals, abrasion, and weather, with heavy duty brass couplings and octagon head for wrench or hand use.

Water Nozzles: Water nozzles must be 1-1/2" straight stream fire hose nozzle, 3/4-inch spray fog nozzle, and 1-1/2 inch fire hose fog nozzle solid brass with barrel that moves freely from full open to full closed. Barrel must be removable for use as full flow plain hose nozzle.

Undercarriage spray nozzle: The undercarriage nozzle must be a full cone spray nozzle with a solid cone shaped spray pattern. The spray pattern must be 80 degrees. The nozzle must have male 1/2-inch NPS threads. The nozzle must have a capacity of 10 gallons per minute at 40 PSI. The nozzle must be Spraying System Co., NESCO, or equal.

99-02750C Construction

99-02750C(1) Installation of Underground Tracer Tape

Continuous underground tracer tape must be installed directly above all buried pipes and 6 inches to 8 inches below finished grade during backfilling operations. Appropriate tape must be used for drain, sewer and water pipes.

99-02750C(2) Installation of Pipe and Fittings

Drain pipe must be installed upgrade (starting from utility connection back to the construction) unless otherwise permitted by the Engineer.

Closing Abandoned Utilities: Open ends of abandoned underground utilities must be closed. Sufficiently strong closures, either 6 inches of concrete or pipe cap with concrete thrust block, must be placed to withstand hydro-static pressure which may result after the pipes are closed.

Damaged Pipe: Damaged pipe must be replaced prior to use. Misaligned pipe must be corrected or replaced prior to use.

Cleaning Pipe:

Interior of pipes must be cleaned of dirt and other materials as the work progresses.

Lines between manholes must be flushed as necessary to remove collected material.

Interior Inspection: Interiors of pipes must be inspected to determine displacement or damage during installation or backfilling.

Chlorination: All potable source water piping and facilities must be flushed and chlorinated by disinfecting solutions as specified in the current edition of the CPC.

Dielectric Waterway: Dielectric waterway must be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Pipe Sleeves: PVC pipe sleeves must be provided where each pipe passes through concrete floor or slab. Inside diameter of sleeves must be at least 3/4 inch larger than outside diameter of pipe. Sleeves must be installed to provide at least 3/8-inch space all around pipe the full depth of concrete. Space between pipes and pipe sleeves must be silicone caulked watertight.

Wall, Footing, and Slab Penetrations:

Pipes passing through existing walls, footings, and slabs penetrations must consist of cored holes.

Coring holes must comply with the requirements described in section 15-5.07.

The annular gap between the pipe and sleeve must be filled with silicone sealant.

99-02750C(3) Installation of Thrust Blocks

Cast-in-place concrete thrust blocks must be installed at PVC pipe fittings under the CPC.

99-02750C(4) Installation of Concrete Tanks

Sand-Oil separator, manhole frames and covers, traffic frames and covers, traffic frames and grates, and other appurtenances must be installed under the manufacturer's instructions and the authorized shop drawings.

Interior of tank must be cleaned of all debris after installation of tank, barrels and manhole frame and covers is complete and prior to testing. All debris from flushing and testing must be removed prior to use.

The sludge sensing system must be installed to comply with the manufacturer's recommendations and as shown.

99-02750C(5) Installation of Manholes, Access, Valve, and Meter Boxes

Manholes, riser sections, concentric/eccentric cones, grade rings, valve, access, utility and meter boxes including extensions must be installed under the plans, these specifications, code and standards and/or the manufacturer's instructions where applicable when authorized by the Engineer.

Joints and penetrations of manholes, valve, access, and meter boxes must be sealed watertight, inside and outside, with epoxy mortar.

Box penetrations must be precast or cored.

Collars must be broom surface finished. Collars must match existing/finished grade.

Where manholes, valve, access or meter boxes or cleanouts are to be installed to grade in areas to be paved or surfaced, no individual structure must be constructed to final grade until the paving or surfacing has been completed in the immediate area.

99-02750C(6) Installation of Cleanouts

Cleanouts must be installed 90 degrees to finished grade and must terminate in a valve box as shown. A concrete pad must be provided full width of the trench under the wye/two way cleanout tee branch.

Cleanouts to grade must be a combination of fittings as shown. Piping and fittings for 4-inch pipe must be sewer pipe. Piping and fittings for 3-inch pipe and smaller must be drain pipe. Cleanout piping must terminate below grade in a valve box.

Collars must be broom surface finished.Collars must match existing/finished grade.

Where cleanouts are to be installed to grade in areas to be paved or surfaced, no individual structure must be constructed to final grade until the paving or surfacing has been completed in the indicated area.

99-02750C(7) Application of Coatings

The interior and exterior surfaces of concrete structures, except the bottom of tanks, must be completely coated with 2 applications of bituminous coating, applied at a rate of 100 square feet per gallon.

Concrete surfaces to be coated must not be coated until 28 days after the last concrete for these structures has been poured.

The edge and bottom of manhole cover seat areas must be coated with a uniform application of heavy duty, waterproof automotive or industrial grease.

99-02750C(8) Installation of Miscellaneous Materials

Securing Pipe: Pipe in the buildings must be held in place by pipe hangers or supports. Material 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. Plastic pipe must have hangers or supports every 5 feet. Horizontal and vertical piping must be securely supported to prevent swaying, sagging or flexing of joints.

Wrapping and Coating Steel Pipe: Steel pipe buried in the ground must be wrapped as described 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. Field joints, fittings and valves for wrapped 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.

Heat Tape: Heat tape must be installed to comply with the manufacturer's instructions.

99-02750C(9) Tap Connection

Connections to existing systems must be as shown and subject to approvals by the local agency and Engineer.

99-02750C(10) Field Quality Control

All pipes must be tested for obstructions and leakage before covering. Obstructions or irregularities must be removed or repaired.

Non pressure (Drain and sewer) pipes must be tested for leakage for a minimum period of 4 hours by filling with water to an elevation of 4 feet above the average invert of pipe. The system must show no visible leaks. Drain and sewer pipe may be tested in sections with the test water progressively passed down the pipes if feasible. Water must be released at a rate which will not create water hammer or surge in the plugged section of pipe.

In lieu of hydrostatic test with water, the air test method, "Air Test," CPC, may be used.

Water pipes must be tested for leakage for a minimum period of 4 hours by filling pipes with water to a pressure of 125 psi. Provisions must be made for release of air. Systems must show no loss in pressure or visible leaks. The Contractor must repair any leaks or irregularities.

Sand-Oil separator must be tested for leakage by filling the tank with water to the level of the outflow line for a period of 24 hours. All seams and joints must be left exposed (except the bottom of the tank) for inspection purposes. The tank must remain watertight. If the tank is rejected, repair or replace..

Sludge sensing system must be tested according to the manufacturer's instructions.

The complete wash water system must be tested for operational use, a minimum of 2 hours per day for 3 consecutive days. The system must operate as intended by design and as authorized by the Engineer. If the system fails, repair or replace.

99-02750D Payment

Not Used

99-02751 UV DISINFECTION UNIT

99-02751A General

99-02751A(1) Summary

Scope: This work consists of installing UV disinfection unit.

Other appurtenances or details not mentioned, which are required for the assembly and proper operation of the unit, must be furnished, placed, or installed as required.

Related work:

Pipes, fittings,and similar equipment must comply with section 99-02750.

Concrete must comply with the requirements for minor work specified under section 99-03300.

99-02751A(2) Definitions

Not Used

99-02751A(3) Submittals

Product Data: Manufacturer's product data must be submitted for manufactured materials and equipment. Manufacturer's product data must include catalog cuts, complete description, performance data, and installation instructions.

Operation and Maintenance Manuals: Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein must be delivered to the Engineer at the job site. The instructions and parts lists must be in a bound manual form and must be complete and adequate for the equipment installed. Inadequate or incomplete material must be returned. The Contractor must resubmit adequate and complete manuals at no expense to the State.

Shop Drawings: Shop drawings for the UV disinfection unit, pipes and appurtenances used in the work must be submitted.

Warranties and guarantees. Manufacturers warranties for material and equipment used in the work must be delivered to the engineer at the jobsite before contract acceptance.

99-02751A(4) Quality Control and Assurance

Not Used

99-02751B Materials

99-02751B(1) Manufactured Units

UV Disinfection unit:

UV disinfection unit must be equipped with UV lamp and power cord, lamp assembly, unit housing and quick disconnect coupling for installation in a pump basin, gravity discharge basin, or discharge tank.

UV Disinfection unit must have

1. The life of UV lamp must be minimum two years.

2. The unit must be NSF equivalency tested.

3. It must be focal coliform reduction of 99.999% (5 logs).

4. It must have power ballast and a lamp current sensor housed in a control panel.

5. It must have typical contact chamber UV dose (65% transmittance, 80% lampdegration)

(55000 W.s/cm x cm at5 gpm (0.32 L/sec)

99-02751C Construction

99-02751C(1) Installation

The UV Disinfection unit must be installed under the manufacturer's instructions.

A control panel for UV disinfection unit must be installed at a reachable location inside the building.

The power cord for the disinfection unit can be installed through a splice box or a conduit can run through the riser.

The power cord must be minimum 25 feet long without any splice. Do not run the power cord with pump wiring or float wiring.

A replacement UV bulb must be provided.

99-02751C(2) Field Quality Control

Testing

Testing of the UV disinfection unit must be conducted in the presence of the Engineer.

Notify the engineer not less than 5 days before testing is to be conducted.

99-02751D Payment

Not Used

99-02760 BRINE GENERATING SYSTEM

99-02760A General

99-02760A(1) Summary

Scope: This work consists of installing and constructing a brine generating system and modifying portions of existing water systems.

Brine generating system must include other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Related Work:

Pipes, fittings, valve boxes, and similar equipment must comply with section 99-02750.

99-02760A(2) Definitions

Not Used

99-02760A(3) Submittals

Product Data:

Materials list for materials to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts to be submitted are as follows:

Brine generating system
Brine pipe and fittings

Submit a certificate of compliance for manufactured products.

Submit a Certificate of Warranty issued by the brine generating system manufacturer. Manufacturer warranties must include, but not be limited to, repair or replace brine generating system or any components that fail in materials, workmanship or that deteriorate under normal conditions within specified warranty period. Warranty period shall be a minimum of 1 year starting after the installation and training are complete. Deliver Certificate of Warranty to the Engineer.

Submit shop drawings for all manufactured products.

99-02760A(4) Quality Control and Assurance

Codes and Standards: All work must comply with the applicable portions of the California Plumbing Code, California Code of Regulations, Title 24, Part 5.

99-02760B Materials

99-02760B(1) Manufactured Units

Brine Generating System: The brine generating system must be a downward flow automatic brine production system where the salt acts as a filter bed as the water moves down through the salt tank and filter screen. The system must be capable of producing 5,000 gallons of brine per hour. The system must be capable of remotely filling trucks with brine, and recording truck fill data via a radio frequency identification (RFID) card reader. The system must be capable of flushing all sediment collected at the bottom of the salt tank without removing salt. The system must be capable of automatically producing brine without the intervention of an operator after initial start, and automatically monitor and control brine concentration during production. The brine production system must consist of a salt tank, control system and all mechanical components to fully operate.

Salt Tank:

1. The salt tank must have a minimum capacity of 5 cubic yards.
2. The salt tank must hold approximately 0.75 cubic yards of sediment without interfering with brine outlet.
3. The minimum inside dumping width must be no less than 120 inches.
4. The hopper must be constructed of non corrosive material.
5. All inside surfaces must be coated with a ceramic resin 0.050 inches thick.
6. The sediment collection area must have a 15 degree slope towards a 12 inch by 12 inch sump to promote debris cleanout.
7. There must be a fresh water flushing system to force sediment to and out of the sump.
8. There must be a pressure transducer connected to the control panel to activate brine pump on and off and water flow into the salt tank. These levels must be adjustable from the HMI on the control panel and be adjustable to within 1 inch increments.
9. There must be reinforced forklift pockets for moving the salt tank.
10. All metallic items must be type 304 stainless steel.
11. The salt tank must have a stainless steel debris screen located above the sump. The debris screen must have 3/16 inch diameter perforations. The debris screen must have 60 square feet of surface area. The debris screen must be capable of supporting 11,000 pounds of salt evenly distributed across the total area.

Control System:

1. The main control panel must be constructed of type 304 brushed stainless steel with valve labels and valve functions etched into the panel.
2. The brine concentration sensor shall monitor the brine for temperature and automatically compensate brine concentration accordingly.
3. Brine pumped from the salt tank must be monitored for salt concentration.
4. All brine exiting the salt tank must pass over the brine concentration sensor that monitors the brine between 19.6 and 27.0 percent concentration by weight.
5. The control system shall include a 256 color LCD touch screen display that must include but not be limited to:
   (a) Actual brine production in the form of percent of sodium chloride concentration by weight.
   (b) Gallons of fresh or treated water used to make brine.
   (c) Graphic illustrations such as liquid flow, system components, parts manuals and operational instructions.
   (d) Self diagnostics of electrical valves indicating what valve is not functioning normally and valve status of open or closed position.
6. Calibration must be performed from the HMI interface located on the face of the control panel. Programming parameters must be password protected.
7. There shall be 4 user selectable operating modes: Normal for brine production, System Test, System Rinse, and Simulate.

8. If the brine concentration is above the target, the brine shall be returned to the salt tank until the correct amount of water is automatically added and the brine reaches the desired concentration.
9. If the brine concentration is below the target, the system shall automatically divert the brine to the salt tank for a second pass through the salt bed to achieve the desired concentration.
10. Once the brine is within 0.3 percent of the target concentration the brine is to be diverted to the brine storage tank.
11. The control system must be configured to accept a signal from a pressure transducer located in the brine storage tank to automatically stop brine production when the tank is full or when the production batch is complete. This circuit shall be capable of displaying storage tank volume.
12. The control system must monitor total gallons of water used, salt used and brine produced daily and seasonally for record keeping.
13. The control system must have a component rinse mode that cycles valves on the main control panel to rinse the system with fresh water,
14. All electric valves shall include a manual override.
15. In the event of a component failure, the system must automatically shut down and inform the operator of the specific failure along with a corrective measure. This includes how to manually override the problem and provide a part number.
16. All wetted parts on the control panel except for pumps must be manifold type glass filled with polypropylene rated for 150 psi.
17. Electrical components mounted onto the control panel must have UL rated conduit protecting connections and wiring outside of the enclosure.
18. Individual components over 10 amps shall have circuit breakers. Components less than ten amps must be fuse protected from inside the control panel. Fuses must have a diagnostic LED to detect fuse fault. Fuse fault must be illuminated red.
19. The control system must be equipped with an inline heater to be supplied by the manufacturer.
20. The control system must include a three way actuated valve to select between domestic water supply and treated water supply. There must be a transducer assembly to indicate when the treated water is low and to automatically switch to domestic water supply when the treated water level is low. The three way actuated valve is to be supplied by the manufacturer.

Mechanical Components:

1. Pumps must be constructed of cast type 304 stainless steel with a stainless steel shaft and impeller.
2. Electric pump motor must be thermally protected 3 HP 220 Volt single phase.
3. Pump seals must be constructed of silicon carbide.
4. Pumps must be capable of delivering 5,000 gallons per hour of brine to the brine storage tank with a dynamic head of 45 feet.
5. All fittings and valves must be manifold type glass filled polypropylene.
6. Wetted steel components must be kept to a minimum.
7. All steel components must be type 304 stainless steel.
8. All exposed electric components must be rated NEMA 12X.
9. All fasteners must be constructed of stainless steel.
10. Air compressor must be at least 30 gallons with a minimum of 120 PSI.

Brine Pipe and Fittings: Brine pipe and fittings not supplied with the brine generating system must be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 200 psi. Other brine pipe must be Ethylene Propylene Diene Monomer (EPDM) suction discharge and pressure hose with stainless steel T-Bolt clamps and type C cam lock couplings.

99-02760C Construction

99-02760C(1) Installation

Brine generating system must be installed by the manufacturer. The operator must be present during the installation.

99-02760C(2) Field Quality Control

Brine generating system must be tested by generating 2 batches of 2,500 gallons of brine. The control system must accurately print out reports of the quantity of brine generated. The RFID card reader must be tested and work properly. The manufacturer must conduct a minimum of 8 hours training session at each location and for not less than 8 employees. Provide an Operation and Maintenance manual to each employee at each location.

99-02760D 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 be 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

99-3 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	658 min.[a]
Concrete (Sewer Structures): For sewer structures, vehicle washracks and mudrinse slabs	658 min.[b]
Concrete (Minor Work): For concrete curbs, sidewalks, driveways, gutter depressions, new door openings, and collars	505 min.

Notes:
[a]For concrete designated by compressive strength, the maximum amount of cementitious material must be 800 pounds per cubic yard.
[b]Concrete must be air entrained under section 90-1.02E. The air content at time of mixing and prior to placing must be 6 ± 1½ percent.

In addition to the above requirements, concrete must comply with section 90-1.02I.

99-03300B(2) Colored Concrete

Not Used

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

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.

Joint Seals: Joint seals must conform to Section 51-2 of the Standard Specifications.

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.

Concrete Sealer: Concrete sealer must be commercial quality VOC-compliant, silane type sealer with hydrophobic and oleophobic properties.

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.

Nonshrink 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.

Anchorages 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.

Hydronic Tubing:

Hydronic tubing must be securely fastened to the bar reinforcing using nylon ties.

The hydronic heating system must be fully tested prior to placing concrete.

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

99-03603 DRILL AND BOND DOWELS

99-03603A General

99-03603A(1) Summary

Scope: This work consists of drilling holes in existing concrete and installing and bonding bar reinforcing steel dowels into such drilled holes in existing concrete.

99-03603A(2) Definitions

Not Used

99-03603A(3) Submittals

Not Used

99-03603A(4) Quality Control and Assurance

Not Used

99-03603B Materials

Bonding Material: The bonding material must be magnesium phosphate concrete, either single component (water activated) or dual component (with a prepackaged liquid activator), as authorized by the Engineer.

Dowels: Dowels must be bar reinforcing steel, under section 99-03300.

99-03603C Construction

Installation:

The holes must be drilled by methods that will not shatter or damage the concrete adjacent to the holes. The diameter of drilled holes must be 1/2 inch larger than the nominal diameter of the dowels unless otherwise shown.

Immediately prior to placing the dowels, the holes must be cleaned of dust and other deleterious materials, and the holes must be dry.

Sufficient bonding material must be placed in the hole so that no voids remain after the dowels are inserted.

Dowels which fail to bond or are damaged before new concrete is placed must be removed and replaced.

Magnesium phosphate concrete must be formulated for minimum initial set time of 15 minutes and minimum final set time of 25 minutes at 70°F. The materials, prior to use, must be stored in a cool, dry environment.

Mix water used with water activated material must be free from oil and impurities and contain not more than 2,000 parts per million as Cl nor more than 1,500 parts per million of sulfate as SO_4.

The quantity of water for single component type or liquid activator for dual component type to be blended with the dry component, must be within the limits recommended by the manufacturer and must be the least amount required to produce a pourable mix.

Magnesium phosphate concrete must not be mixed in containers or worked with tools containing zinc, cadmium, aluminum, or copper metals.

The surface of any dowel coated with zinc or cadmium must be coated with a colored lacquer before installation of the dowel. The lacquer must be allowed to dry thoroughly before embedment of said dowels.

99-03603D Payment

Not Used

99-4 MASONRY

99-04230 CONCRETE MASONRY UNITS

99-04230A General

99-04230A(1) Summary

This work includes:

1. Concrete masonry units
2. Mortar and grout
3. Bar reinforcement
4. Ties and anchors

99-04230A(2) Related Work

Water Repellent Coating: Comply with section 99-07182.

99-04230A(3) Definitions

CMU: Concrete masonry unit.

99-04230A(4) Performance Requirements

Masonry Compressive Strength: Provide masonry that develops the compressive strength (f'm) shown at 28 days.

99-04230A(5) Submittals

Product Data: Submit manufacturer's descriptive data for each type of masonry unit, accessory, and manufactured product.

Samples: Submit two sample CMUs for each color and architectural finish.

Certificates of Compliance: Submit certificate of compliance for CMUs, aggregate for grout, and ready-mixed grout.

Grout Mix Design: Submit a grout mix design for each grout mix proposed for use. Submit a revised grout mix design for any proposed change to the proportions of an authorized grout mix.

Shop Drawings: Submit calculations and shop drawings for temporary supports of masonry lintels. Design and construct temporary supports to provide the necessary rigidity and to support loads that will be applied. Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Qualification Data: Submit qualification data for proposed testing laboratory.

Special Inspector Final Report: The special inspector must submit a final signed report to the Engineer and to you stating whether the work requiring special inspection, to the best of the inspector's knowledge, complies with the authorized plans, specifications, and the applicable workmanship provisions of these special provisions and the 24 CA Code of Regs Pt 2.

Field Quality Control Plan:

Submit a written Field Quality Control Plan that identifies the inspector, the testing laboratory, and the procedures to be used. The plan must comply with these specifications and the CBC.

Designate a Masonry Quality Control Manager (MQCM) in the Field Quality Control Plan. The MQCM must be directly responsible to you for the quality of masonry, including materials and workmanship, performed by you and your subcontractors.

The MQCM must be the sole individual responsible to you for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer.

The MQCM must not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The MQCM may be your employee.

99-04230A(6) Quality Control and Assurance

Masonry Preconstruction Testing:

Employ and pay all costs for the services of a testing laboratory experienced in performing preconstruction masonry tests.

The testing laboratory must comply with ASTM E 329.

Perform preconstruction testing to determine masonry compressive strength for each grout mix to be used under one of the following 24 CA Code of Regs Pt 2 test methods:

1. § 2105.2.2.1, except the grout must comply with § 2105.2.2.1.2, "Concrete Masonry," 3.3.2.
2. § 2105.2.2.2. The grout compressive strength must also be tested under ASTM C 1019 and be equal to or greater than the masonry compressive strength, but not less than 2,000 psi.

The grout compressive strength at 28 days must be 85 percent or more of the minimum required grout compressive strength.

The testing laboratory must report test results to the Engineer and you, on the same day the tests are made.

Do not perform masonry work until the required masonry and grout compressive strengths are attained.

Single Source Responsibility:

For each product required, obtain exposed CMUs of a uniform color and architectural finish from a single source and from a single manufacturer.

Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from a single source or producer for each aggregate.

99-04230A(7) Delivery, Storage and Handling

Delivery: Deliver masonry materials to the project in an undamaged condition.

Storage:

Store CMUs on elevated platforms in a dry location. If CMUs are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If CMUs become wet, do not install until they are dry.

Store cementitious materials on elevated platforms and in a dry location. Do not use cementitious materials that have become damp.

Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

Handling: Prevent damage, contamination, corrosion, or other deterioration to masonry materials when handling.

99-04230(8) Project Conditions

Protection of Masonry: Cover partially completed masonry, tops of walls, projections, and sills with waterproof sheeting when construction is not in progress.

Stain Prevention:

Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

Protect the base of walls from rain-splashed mud and from mortar splatter by spreading coverings on the ground and over wall surfaces.

Protect sills, ledges, and projections from mortar droppings. Protect surfaces of window and door frames, and other similar products with painted and integral finishes, from mortar droppings.

99-04230B Materials

99-04230B(1) Concrete Masonry Units

Concrete Masonry Units:

Provide CMUs of nominal size, color, and architectural finish as shown. Provide hollow, load bearing, light weight or medium weight, open-ended CMUs that comply with ASTM C 90.

Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

99-04230B(2) Masonry Lintels

Masonry Lintels: Construct built-in-place masonry lintels from lintel CMUs, with reinforcing bars placed as shown.

99-04230B(3) Mortar and Grout Materials

Mortar Materials:

Mortar: Comply with ASTM C 270.

Cement: Comply with ASTM C 150, Type II, low alkali portland cement.

Lime: Comply with ASTM C 207, Type S.

Aggregate: Comply with ASTM C 144, with maximum 10 percent passing the No. 100 sieve.

Coloring for Mortar: Chemically inert, fade resistant mineral oxide or synthetic type.

Premixed Mortar: A premixed packaged blend containing only cement, lime, and sand, with or without color, that requires only water to prepare for use as masonry mortar. Packages of premix must bear the manufacturer's name, brand, contents, weight, and color identification.

Grout Materials:

Grout must comply with ASTM C 476, coarse grout, except for grout proportions. Grout proportions must comply with "Grout Mixes" in section 99-04230B(6).

Cementitious material must comply with section 90-1.02B.

Aggregate: Comply with ASTM C 404, except 100 percent of the coarse aggregate must pass the 3/8-inch sieve. Soundness loss must not exceed 10 percent when tested under California Test 214.

99-04230B(4) Reinforcement

Bar Reinforcement: Comply with ASTM A 615/A 615 M, Grade 60, or ASTM A 706/A 706 M.

99-04230B(5) Ties and Anchors

Anchors, Ties, Angles, and Metal Lath: Commercial quality and galvanized.

Anchor Bolts and Anchor Rods, Nuts and Washers:

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

Nuts: Comply with ASTM A 563.

Washers: Comply with ASTM F 436.

99-04230B(6) Mortar and Grout Mixes

Dry Pack Mortar: One part portland cement to not over 3 parts of clean sand, mixed with a minimum amount of water for hydration and packing.

Mortar Mix: Proportion by loose volume with one part cement, 1/4 to 1/2 part hydrated lime, and 2-1/4 to 3 parts aggregate. Tint with coloring to match the masonry units.

Premixed Mortar: Packages of premixed mortar must consist of one part cement, 1/4 to 1/2 part hydrated lime, and 2-1/4 to 3 parts aggregate, and no other ingredients.

Grout Mixes:

Grout proportions must be determined by one of the following methods:

1. Proportioned by volume complying with ASTM C 476, Table 1.
2. Specified compressive strength complying with "Grout Mix Design" in section 99-04230A(5).

Mix with sufficient water to produce a mix consistency suitable for pumping without segregation. Provide grout with a slump of 8 to 11 inches.

Nonshrink Grout: Comply with ASTM C 1107, match color with the mortar.

Aggregate: Measure in a damp, loose condition.

99-04230C Construction

99-04230C(1) Installation

Comply with 24 CA Code of Regs Pt 2 § 2104. Comply with tolerances specified in § 2104 unless otherwise shown.

Lay masonry units in running bond, unless otherwise shown.

Roughen, clean, and lightly wet the contact surfaces of existing material where fresh masonry joins concrete or masonry. The roughened surface must be at least as rough as a wood troweled surface. Remove laitance, curing compounds, debris, dirt, and any substance which decreases bond to the fresh masonry.

Erect masonry only when the ambient air temperature is above 40 degrees F.

If masonry is erected when the ambient air temperature exceeds 100 degrees F, keep surfaces of masonry moist with water for at least 24 hours. Uniformly apply water with a fog spray at time intervals required to keep the surfaces moist, but no more than 3 hours between applications.

Firmly secure anchors, bolts, dowels, reglets, and other miscellaneous items to be cast into the wall in place before grout is poured.

Laying Masonry Units:

1. Lay CMUs dry.
2. Keep cells dry during laying of units in inclement weather by covering incomplete walls. Do not use wooden boards and planks as covering materials. Extend covering down each side of masonry walls approximately 2 feet.
3. Keep chases free from debris and mortar.
4. Use bond beam units with an opening at each cross web at horizontal reinforcing bars.
5. Make cuts with a masonry saw to neat and true lines. Do not use blocks with excessive cracking or chipping of the finished surfaces exposed to view.
6. Leave openings to inset outlet boxes, access control keypads, intrusion detection sensors, and similar components in to masonry, with concealed wiring.

Bar Reinforcement:

Position bar reinforcement as shown and securely hold in position with either wire ties or spacing devices near the ends of bars and at intervals not exceeding 192 bar diameters. Wire must be 16-gauge or heavier. Do not use wooden, aluminum, or plastic spacing devices. Tolerances for the placement of vertical reinforcement in walls and flexural elements must be ±1/2 inch. Tolerances for longitudinal reinforcement in walls must be ±2 inches.

The minimum spacing for splices in vertical reinforcement for masonry walls must be 4 feet plus lap.

Do not place bar reinforcement in the plane of mortar joints.

Mortar:

Mortar joints must be approximately 3/8 inch thick. Lay units with all head and bed joints filled solidly with mortar for the full width of masonry unit shell. Shove head joints tight. Exposed joints must be concave and tooled smooth, unless otherwise shown.

Mortar that has been mixed more than one hour must not be retempered.

Preserve the unobstructed vertical continuity of the grout during mortar placement in joints. Any overhanging mortar projecting more than 1/2 inch, or other obstruction or debris must be removed from the inside of cells.

Pointing:

During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application as shown.

Remove splashes, stains, and spots on the faces of the masonry exposed to view.

99-04230C(2) Lintels

Temporarily support formed-in-place lintels for a minimum of 15 days after the wall has been completed.

99-04230C(3) Grouting

Place CMUs full height of the masonry wall before grouting, or place CMUs full height of the grout pour before grouting.

For grout pours over 5 feet in height, provide cleanouts in the bottom course at every cell containing vertical reinforcement, at a maximum spacing of 32 inches. Each cleanout must be at least 3 inches square. After cell inspection, seal cleanouts before filling with grout.

Place grout in a continuous pour in grout lifts. Grout lifts must not exceed 5 feet. The interruption between placing successive grout lifts must be no more than one hour. If the interruption is more than one hour, another grout pour must be used.

Solidly fill cells with grout. For each grout lift, consolidate grout in the cells at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost.

Between grout pours, form a horizontal construction joint by stopping the grout a minimum of 1-1/2 inches below the top of the last course, except if the joint is at a bond beam, the joint must be 1/2 inch below the top of the bond beam unit or at the top of the wall.

99-04230C(4) Field Quality Control

You must employ a special inspector and a testing laboratory to perform inspections and structural tests of masonry to verify the masonry construction complies with 24 CA Code of Regs Pt 2 § 1704 and § 2105.

Masonry special inspection personnel or testing laboratories used in the work must not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project.

Special Inspector:

The special inspector must be, as a minimum, an ICC certified Structural Masonry Special Inspector. The special inspector must perform the inspections required under § 1704.5.

The special inspector must prepare a "Daily Field Report" providing information regarding the specific operations witnessed, including placing of CMUs and bar reinforcing, grouting, fabrication of test specimens, and other observations of importance to the work.

A "Daily Field Report" is required for each day that the special inspector is on the job site. Deliver a copy of these reports to the Engineer on the day following the preparation.

Testing:

Perform testing of masonry for every 5,000 square feet of CMU wall area, or portion thereof.

Determine masonry compressive strength under "Masonry Preconstruction Testing" in section 99-04230A(6).

Any work not meeting the requirements of 24 CA Code of Regs Pt 2 § 2105 must be redone and retested. Sampling, inspecting, reworking, and retesting of material will be done at your expense.

99-04230C(5) Repairs and Protection

Remove and replace CMUs that are loose, chipped, broken, stained, do not match adjoining units, or are otherwise damaged. Install new units in fresh mortar to match adjoining units, and point joints to eliminate evidence of replacement.

Protect completed masonry from freezing for a period of at least 5 days.

Completed masonry or grouted bearing plates must not receive loading from subsequent portions of the work within 7 days of placement.

99-04230D Payment

Not Used

99-5 METALS

99-05120 STRUCTURAL STEEL FOR BUILDINGS

99-05120A General

99-05120A(1) Summary

This work consists of fabricating, assembling, and erecting structural steel.

99-05120A(2) Definitions

demand critical welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" shown.

heavy sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1 1/2 inches
2. Welded built-up members with plates thicker than 2 inches
3. Column base plates thicker than 2 inches

RCSC: The Research Council on Structural Connections.

seismic-load-resisting system (SLRS): Elements of structural-steel frame designated as SLRS or along grid lines designated as SLRS shown, including columns, beams, and braces and their connections.

structural steel: Elements of the structural steel frame essential to support the design loads, including:

1. Anchor rods
2. Base plates
3. Canopy framing
4. Angles and bearing plates for steel joists
5. Channel sections and angles in wash building upper wall framing

99-05120A(3) Submittals

Product Data: Submit product data for items to be incorporated into the work, including structural steel, high strength fastener assemblies, and alternative connectors.

Shop Drawings:

Submit shop drawings that include the following:

1. A comprehensive list of all structural steel elements to be used as described under AISC 303, section 2.1, "Definition of Structural Steel."
2. Sequence of shop and field assembly and erection, welding sequence and procedures, and welding nondestructive testing (NDT) sequence and procedures.
3. Identification of welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Location of butt welded splices on a layout drawing of the entire structure.
5. Location and details of any temporary supports that are to be used.
6. Type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted connections.
7. Identification of members and connections of the seismic-load-resisting system.
8. Identification of locations and dimensions of protected zones.
9. Identification of demand critical welds.
10. Any changes proposed in the work, details of connections and joints exposed to the weather, and details for connections not dimensioned on the plans. If changes are proposed or connections are designed, submit design calculations stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration must be shown.

Shop Drawings for Falsework: Submit shop drawings and calculations for falsework for use during the erection of structural steel. Design and construct the falsework to provide the necessary rigidity, and to support the applied loads. Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Submit WPSs and PQRs under AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

Qualification Data: Submit fabricator and welder qualifications.

Certificates of Compliance: Submit a certificate of compliance for structural steel products. Include mill test certificates for each heat number of steel used in the work.

Final Drawings:

At the completion of each structural steel building, submit one set of reduced prints on 60-pound (minimum) bond paper, 11 inches x 17 inches, of the corrected original tracings of all authorized shop drawings for each building. Include an index prepared specifically for the drawings for each building containing sheet numbers and titles on the first reduced print in the set for each building. Arrange reduced prints for each building in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image must be clearly visible and visually parallel with the edges of the page. Provide a clear, legible symbol on the upper left side of each page to show the amount of reduction, and provide a horizontal and vertical scale on each reduced print to facilitate enlargement to original scale.

99-05120A(4) Quality Control and Assurance

Fabricate, assemble, and erect structural steel under AISC 303, 325, 341, and 360.

Welding: Weld under AWS D1.1/D1.1M and AWS D1.8/D1.8M.

Welding Qualifications:

Qualify procedures and personnel under AWS D1.1/D1.1M.

Welders and welding operators performing work on bottom-flange, demand-critical welds must pass the supplemental welder qualification testing, under AWS D1.8/D1.8M. FCAW-S and FCAW-G must be considered separate processes for welding personnel qualification.

99-05120A(5) Delivery, Storage, and Handling

Load, transport, unload, and store structural materials so they are kept clean and undamaged. Store materials to permit access for inspection and identification.

Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Provide covers for protection of materials.

99-05120B Materials

99-05120B(1) General

Steel Bars, Plates, Channels, Angles, and Shapes (other than W-shapes): For each yield stress shown, comply with the following:

1. ASTM A 36/A 36M, when minimum yield stress is 36 ksi.
2. ASTM A 572/A 572M, Grade 50, when minimum yield stress is 50 ksi.

W-shapes: Comply with ASTM A 992/A 992M.

Pipe: Comply with ASTM A 53/A 53M, Grade B, standard weight, unless otherwise shown.

Hollow Structural Sections: For each yield stress shown, comply with the following:

1. ASTM A 501, when minimum yield stress is 36 ksi.
2. ASTM A 500/A 500M, Grade B, when minimum yield stress is 42 ksi for round shapes, and when minimum yield stress is 46 ksi for square and rectangular shapes.
3. ASTM A 500/A 500M, Grade C, when minimum yield stress is 46 ksi for round shapes, and when minimum yield stress is 50 ksi for square and rectangular shapes.

99-05120B(2) Bolts, Connectors, and Anchors

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.

Machine Bolts, Nuts, and Washers:

Machine Bolts: Comply with ASTM A 307.

Nuts: Comply with ASTM A 563.

Washers: Commercial quality.

99-05120B(3) Mortar

Mortar: Use one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

99-05120B(4) Shop Fabrication

Shop Fabrication and Assembly:

1. Cuts must not deviate more than 1/16 inch from the intended line. Remove roughness, notches, and gouges.
2. At points of loading, bearing stiffeners must be square with the web. At least 75 percent of the stiffener must be in contact with the flanges.
3. Finished members must be true to line and be free from twists, kinks, warps, dents, and open joints. Finished members must have square corners and smooth bends
4. Exposed edges and ends of metal must be dressed smooth, with no sharp edges, and with corners slightly rounded.
5. Mark and match-mark materials for field assembly.
6. Complete structural steel assemblies, including welding of units, before shop-priming operations.

Connections:

1. Clean abutting surfaces at connections.
2. Do not cut or weld at the job site, except as shown on the authorized shop drawings or authorized by the Engineer.
3. Cut, drill, or punch holes perpendicular to steel surfaces. Finished holes for bolts must be cylindrical. Sub-punch and sub-drill holes ¼ inch smaller in diameter than the diameter specified for the finished hole.

Bolted Connections:

Fabricate steel to steel bolted connections with machine bolts or HS fastener assemblies when shown.

Machine Bolts: Snug tighten.

The bolt head type and head location must be consistent within a joint.

Install nuts on side of member least exposed to view.

Holes for Other Work: Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarged holes by burning. Drill holes in bearing plates.

99-05120B(5) Shop Finishes

Shop prime structural steel members, except those to receive sprayed-fireproofing.

Clean and coat steel surfaces of shop primed members under section 99-09900.

99-05120B(6) Source Quality Control

Welded Connections: Test and inspect welded connections under AWS D1.1/D1.1M and the following:

Inspection:

1. Comply with AISC 341, section Q5.2, except for CJP groove welds not receiving ultrasonic testing, perform magnetic particle testing on 100% of each root weld pass and each final weld pass of these welds.
2. Perform magnetic particle testing on 25% of each PJP groove weld. The Engineer will select the locations for testing. The cover pass must be ground smooth before testing.

Acceptance Criteria:

1. Ultrasonic Testing: Comply with AWS D1.1/D1.1M, Table 6.2 for statically loaded nontubular connections.
2. Magnetic Particle Testing: Comply with AWS D1.1/D1.1M, Clause 6, Part C.

Repairs:

1. If repairs are required, perform NDT on the repaired portion and re-inspect the weld by performing additional NDT on the entire length of the unrepaired portion of the weld under "Source Quality Control."
2. NDT of repaired work must be performed at your expense.

99-05120C Construction

99-05120C(1) Erection

Set structural steel accurately in locations and to elevations indicated.

Setting Bases and Bearing Plates:

Clean concrete and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

Set base plates and bearing plates for structural members on wedges or other adjusting devices.

Snug-tighten anchor bolts when no specific joint type is shown after supported members have been positioned and plumbed. Pretension anchor bolts when joints are shown as such after supported members have been positioned and plumbed. Do not remove wedges or shims except, if protruding, cut off flush with edge of plate before packing with mortar.

Solidly pack mortar between bearing surfaces and base or bearing plates so there are no voids. Neatly finish exposed surfaces and allow to cure.

Field Splices:

Field splices must be made only at the locations shown on authorized shop drawings or authorized by the Engineer.

Accurately assemble parts in their final position as shown and in true alignment with related and adjoining work before final fastening.

Support parts to provide a vibration free, rigid, and secure installation.

99-05120C(2) Field Connections

Assembly and installation of bolted connections must comply with "Bolted Connections" under "Shop Fabrication."

99-05120C(3) Field Quality Control

Testing and inspection of field-welded connections must comply with "Welded Connections" under "Source Quality Control."

99-05120C(4) Field Finishes

Touch-up Painting: After erection, clean field welds, bolted connections, and abraded areas of shop paint under SSPC-SP 2 or SSPC-SP 3. Apply one coat of the same coating as applied for shop painting to the cleaned areas.

After touch-up painting, coat all surfaces with a second prime coat, and finish coats when specified, to comply with section 99-09900.

99-05120D Payment

Not Used

99-05210 OPEN WEB STEEL JOISTS

99-05210A General

99-05210A(1) Summary

This work includes:

Joist accessories.

99-05210A(2) Definitions

SJI: Steel Joist Institute.

SJI Specifications: SJI's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in the SJI specifications.

99-05210A(3) Submittals

Product Data: Submit manufacturer's descriptive data and installation instructions. Submit quality control manual and welder qualifications for field welding.

Shop Drawings:

Submit shop drawings and design calculations for the steel joists, permanent bracing, continuity angles, and connection details. Include the following:

1. Show layout, location and identification of each steel joist, number, type, and spacings of steel joists. Include joining and anchorage details, bridging, joist accessories, splice and connection locations and details, and attachments to other construction.
2. Show size and shape of truss members and both temporary and permanent bracing members.
3. Calculations for design of steel joists, bracing, and connections must include a list of applied loads and load combinations with the resulting member forces and member stresses. Design steel joists and connections for the chord forces shown.
4. Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.
5. If the design calculations contain or consist of computerized or tabulated calculations, the values pertaining to the design must be identified, described, or indexed in such a manner that a design review can be performed.

Certificates of Compliance: Submit a certificate of compliance for steel joists.

Manufacturer Qualification: Submit manufacturer qualification as an informational submittal.

99-05210A(4) Quality Control and Assurance

Manufacturer Qualification: The manufacturer must be certified by the SJI to manufacture steel joists under the SJI specifications.

Codes and Standards: Design steel joists and permanent bracing for the loads shown and other applied loads, including fire sprinkler systems. The design must comply with the CBC and the SJI specifications.

Field Welding: Qualify procedures and personnel for field welding under AWS D1.1/D1.1M, "Structural Welding Code - Steel."

Identification: Stamp or mark each joist with a location identification mark or symbol.

99-05210A(5) Delivery, Storage, and Handling

Protect steel joists from corrosion, deformation, and other damage during delivery, storage, and handling. Provide covers for protection of materials.

99-05210B Materials

99-05210B(1) General

Open Web Steel Joists: Comply with the SJI specifications for LH-Series. Steel joists must be tapered and designed to support the loads shown.

Bearing Plates, Fasteners, and Accessories**:** Comply with the authorized shop drawings.

Anchors: Comply with the specifications for anchors in section 99-05500.

99-05210B(2) Fabrication

Fabricate steel joists under the SJI specifications.

Build camber into the steel joists if required by the design.

99-05210B(3) Shop Finishes

Clean and prepare surfaces under one of the following:

1. SSPC-SP 1 and SSPC-SP 2
2. SSPC-SP 1 and SSPC-SP 3
3. The coating manufacturer's instructions.

Shop Paint: Comply with SSPC-Paint 15. Apply one coat.

Apply and cure the coating under the coating manufacturer's instructions.

99-05210C Construction

99-05210C(1) Erection

Installation of steel joists must comply with the authorized shop drawings. Accurately cut steel joists and bracing members to provide tightly fitted joints and connections.

Remove and replace damaged steel joists at your expense, except when field repair is authorized by the Engineer. Repairs must comply with the manufacturer's instructions.

99-05210C(2) Installation

Install steel joists and accessories plumb, square, and true to line. Securely fasten steel joists to supporting construction under SJI specifications, steel joist manufacturer's instructions, and the authorized shop drawings. Do not field cut or otherwise alter steel joists without the authorization of the Engineer.

Install temporary bracing and erection bridging, connections, and anchors to ensure that steel joists are stabilized during construction.

Bearing plates must have full bearing after the supporting members have been plumbed and properly positioned, before placing superimposed loads.

Comply with specifications for welding, appearance and quality of welds, and methods used in correcting welding work under AWS D1.1/D1.1M, "Structural Welding Code - Steel." Exposed welds must be ground smooth and flush.

Install and connect bridging concurrently with steel joist erection before construction loads are applied. Distribute temporary loads so that the design carrying capacity of any steel joist is not exceeded. Do not apply loads to bridging during construction or in the completed work.

Secure permanent bracing before any sustained permanent loads are applied to the steel joist system.

99-05210C(3) Field Finishes

After installation, clean and prepare field connections, rust spots, and abraded surfaces of shop-primed steel joists and accessories under SSPC-SP 2 or SSPC-SP 3. Prime or reprime the cleaned and prepared surfaces with the same or compatible type of coating used in the shop priming.

Coatings: Comply with the specifications in section 99-09900. Clean and prepare steel surfaces under the manufacturer's instructions. The final finish color must be authorized by the Engineer.

99-05210D Payment

Not Used

99-05310 METAL DECK

99-05310A General

99-05310A(1) Summary

Scope: This work consists of installing metal deck.

Metal deck includes ribbed sheet steel decking units, bent plates, accessories, fasteners and other components required for a rigid, secure, and complete installation.

99-05310A(2) References

The design, fabrication, and erection of metal deck must comply with the applicable requirements of the American Iron and Steel Institute (AISI) publication, "North American Specifications for the Design of Cold Formed Steel Structural Members," the applicable Steel Deck Institute (SDI) "Code of Standard Practice," and applicable "Specifications and Commentary" in its "Design Manual for Composite Decks, Form Decks and Roof Decks" (Publication 31).

Welding must comply with AWS D1.3, "Structural Welding Code - Sheet Steel."

99-05310A(3) Definitions

Not Used

99-05310A(4) Submittals

Product Data: Submit manufacturer's descriptive data for each type of deck and for accessories.

Shop Drawings: Submit shop drawings showing complete erection layouts, details, dimensions, deck section properties. Drawings must show types and gages, fastening methods, including the location, type and sequence of connections, sump pans, cut openings, surface finishes and temporary supports or bracing.

Certificates of Compliance: Submit a certificate of compliance for metal decking.

99-05310A(5) Quality Control and Assurance

Qualification of Field Welding:

> Welding processes and welding operators must be qualified under "Welder Qualification," procedures in AWS D1.1, "Structural Welding Code - Steel."
>
> Welding decking in place is subject to inspection and testing. Defective work must be removed and replaced with acceptable work.

99-05310A(6) Delivery, Storage, and Handling

Metal deck units and accessories must be transported, stored, and erected in a manner that will prevent corrosion, distortion, or other damage.

Deck units must be stored off the ground with one end elevated to provide drainage.

99-05310B Materials

99-05310B(1) General

Acceptable Manufacturers: Verco Manufacturing Co.; Nucor Corp; Vulcraft Group; ASC Profiles; or equal.

Deck Units:

Deck units, closures, and plates must be fabricated from galvanized sheet steel complying with ASTM A 653/A 653M, Grade 33 [230], and ASTM A 924/A 924M, Structural Steel (SS).

Galvanizing must comply with ASTMA 924/A 924M, G60 [Z180].

Miscellaneous Steel Shapes: Miscellaneous steel shapes must comply with ASTM A 36/A 36M.

Anchor Clips, Vent Clips, Flashing, Saddle Plates, Flexible Closure Strips, and Other Accessories: Anchor clips, vent clips, flashing, saddle plates, flexible closure strips, and other accessories must be as recommended by the decking manufacturer.

99-05310B(2) Fabrication

Deck units must be formed to span 3 or more supports, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps unless otherwise shown.

Deck units must comply with the configurations, metal thickness, depth and width, and section properties shown.

End bearing must be not less than 1½ inches.

Metal Closure Strips: Metal closure strips for opening between deck units and other construction must be fabricated from the same gage and material as the adjacent deck units. Strips must be formed to provide tight-fitting closures at end of cells or flutes and sides of decking.

Roof Sump Pans: Sump pans must be fabricated from single piece of galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Sump pans must be of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Pans must be recessed not less than 1½ inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains must be cut in the field.

Cleaning: When spray-on fireproofing is specified, the decking manufacturer must supply decking free of amounts of oil or lubricants which would significantly impair the adhesion of the spray-on fireproofing.

99-05310C Construction

99-05310C(1) General

Not Used

99-05310C(2) Installation

Deck units and accessories must be installed under the manufacturer's instructions, SDI Publication 31, and authorized shop drawings.

Units must be placed on supporting steel framework, adjusted in place and properly aligned before being permanently fastened. Ends of units must have positive bearing over structural supports.

Cutting and fitting must present a neat and true appearance with exposed burrs removed. Openings through the decking must be cut square and must be reinforced as recommended by the decking manufacturer.

The metal deck must not be used as a working platform before deck units are fastened in place. Supplies, equipment or other loads must not be stored on the deck. Mechanical equipment or other loads must not be hung from metal roof decking.

Welding:

Welding must comply with AWS D1.1 and D1.3, and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

Welding washers must be used where recommended by the manufacturer.

Fastening Roof Deck Units: Roof deck units must be fastened to supporting steel members as shown.

Fastening Side Laps: Side laps of adjacent deck units must be fastened as shown.

Roof Sump Pans: Roof sump pans must be placed over openings provided in roof and welded to top decking surface. Welds are to be spaced at not more than 12 inches with at least one weld in each corner. Cut opening in sump bottom to accommodate drain size indicated.

Field Painting:

Immediately following erection, field welds, bolted connections and abraded areas must be cleaned with a wire brush.

Galvanized surfaces must be touched-up with galvanizing repair paint recommended by the manufacturer.

99-05310D Payment

Not Used

99-05500 BUILDING MISCELLANEOUS METAL

99-05500A General

99-05500A(1) Summary

Scope: This work consists of fabricating and installing building miscellaneous metal.

Building miscellaneous metal consists of the following:

1.Galvanized pipe guard rail, chain guard
2. Bent plates
3. Steel expanded metal screens
4. Galvanized chain link metal gate
5. Galvanized electrical post

Including all anchors, fastenings, hardware, accessories, and other supplementary parts necessary to complete the work.

99-05500A(2) References

Codes and Standards: Welding of steel must comply with AWS D 1.1, "Structural Welding Code - Steel" and D 1.3, “Structural Welding Code - Sheet Steel.”

99-05500A(3) Definitions

Not Used

99-05500A(4) Submittals

Product Data: Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications.

Shop Drawings: Shop drawings of fabricated items must be submitted.

99-05500A(5) Quality Control and Assurance

Shop Assembly: Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

Inspection and Tests: Materials and fabrication procedures must be subject to inspection and tests by the Engineer, in mill, shop, and field.

99-05500B Materials

99-05500B(1) General

Steel Bars, Plates, and Hot-rolled Shapes: Steel bars, plates, and hot-rolled shapes must comply with ASTM A 36/A 36M.

Galvanized Sheet Steel: Galvanized sheet steel must comply with ASTM A 653/A 653M. Galvanizing must be G60.

Checkered Floor Plates: Checkered floor plates must be commercial quality steel with standard raised pattern.

Pipe: Pipe must be commercial quality standard steel pipe.

Hollow Structural Sections: Hollow structural sections must comply with ASTM A 500/A 500M, Grade B, or A 501.

Bolts, Studs, Threaded Rods, Nuts, and Washers:

Bolts, studs, and threaded rods for general application must comply with ASTM A 307 or F 1554, Grade 36.

Nuts must comply with ASTM A 563.

Washers bearing on wood surfaces must be commercial quality. Washers bearing on steel surfaces must comply with ASTM F 844 or F 436.

Fittings: Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings must be commercial quality pipe and fittings.

Expansion Anchors: Expansion anchors must be ICC approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut, and washer.

Powder Driven Anchors: Powder driven anchors must be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel must comply with ASTM A 227, Class 1. The diameter, length, and type of shank and the number and type of washer must be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Resin Capsule Anchors: Stud anchors for resin capsule anchors must comply with ASTM A 307 or F 1554, Grade 36, threaded steel rod with hex nut and washer and sealed glass capsule or cartridge containing an adhesive composed of unsaturated polyester resin and benzol peroxide coated quartz sand. Resin capsule must be Hilti; Molly; or equal.

Drainage Grates: Drainage grates must be fabricated from steel bars as specified herein; ductile iron castings complying with ASTM A 536, Grade 65-45-12; or carbon steel castings complying with ASTM A 27, Grade 65-35.

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

99-05500B(2) Shop Fabrication

Workmanship and Finish:

Workmanship and finish must be equal to the best general practice in modern shops.

Miscellaneous metal must be clean and free from loose mill scale, flake rust and rust pitting, and must be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching must be straightened.

The thickness of metal and details of assembly and support must give ample strength and stiffness.

Built-up parts must be true to line and without sharp bends, twists, and kinks. Exposed ends and edges of metal must be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather must be made up to exclude water.

Galvanizing: Items indicated on the plans to be galvanized must be hot-dip galvanized after fabrication. The weight of galvanized coating must be at least 1½ ounces per square foot of surface area, except drainage grates must have at least 2 ounces per square foot of surface area.

Painting: Building miscellaneous metal items that are not galvanized must be cleaned and coated with 1 prime coat prior to erection under section 99-09900. After erection, surfaces must be coated with a second prime coat, and finish coats when specified, to comply with the requirements specified under section 99-09900.

Drainage Pipes, Frames and Grates:

Drain piping must have connections sealed watertight.

Drainage grates must have end bars of the same cross section as support bars. Connections between end bars and support bars of structural steel must be welded all around.

Drainage frames must be angles and plates as shown.

Drainage grates and frames must be match marked.

Steel Pipe Railings and Handrailings:

Pipe handrailing must consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe must be closed, except for a 1/8-inch diameter weep hole at the low point.

All corners on railings must be rounded. Simple and compound curves must be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors must be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices must be provided for connecting railings and handrails to concrete or masonry.

Steel railing must be galvanized after fabrication. After galvanizing, all elements of the railing must be free of fins, abrasions, rough or sharp edges, and other surface defects and must not be kinked, twisted, or bent.

99-05500C Construction

99-05500C(1) General

Anchorages:

Anchorage devices and fasteners must be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

Cutting, drilling, and fitting must be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

Loose Leveling and Bearing Plates: Plates must be set on wedges or other adjustable devices. Anchor bolts must be snug tightened after the plates have been positioned and plumbed. Mortar must be packed solidly between bearing surfaces and plates to ensure that no voids remain.

Steel Pipe Railings and Handrailings:

Railings must be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction.

Resin capsule anchors must not to be used for anchoring railings and handrailings.

Powder Driven Anchors: Powder driven anchors must be installed with low velocity powder actuated equipment to comply with the manufacturer's instructions and State and Federal OSHA regulations.

Resin Capsule Anchors: Resin capsule anchors must be installed in compliance with the manufacturer's instructions.

Bolted connections not otherwise specified or shown on drawings must be snug-tightened.

99-05500C(2) Damaged Surfaces

Galvanized surfaces that are abraded or damaged must be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating. The clean areas must then be painted with 2 spot applications of a coating complying with the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) and listed on MPI List Number 18, Primer, Zinc Rich, Organic, and meeting the requirements under section 99-09900.

99-05500D Payment

Not Used

99-6 WOOD AND PLASTICS

Not Used

99-7 THERMAL AND MOISTURE PROTECTION

99-07182 WATER REPELLENT COATING

99-07182A General

99-07182A(1) Summary

Scope: This work consists of applying water repellent coating to concrete or masonry surfaces.

The water repellent coating must be applied to all exterior concrete or masonry surfaces and exposed aggregate surfaces as shown.

99-07182A(2) Definitions

Not Used

99-07182A(3) Submittals

Product Data: Manufacturer's descriptive data, application instructions and general instructions for water repellents must be submitted.

Certificates of Compliance: Submit a certificate of compliance with each shipment of water repellent coating material.

99-07182A(4) Quality Control and Assurance

Codes and Standards: Water repellent coatings must comply with all rules and regulations concerning air pollution in the State of California.

99-07182B Materials

Water Repellent Coating: Water repellent coating must be clear, colorless, water-based sealer not containing silane, recommended for use on concrete and concrete unit masonry in vertical applications.

99-07182C Construction

Preparation: All surfaces to receive water repellent coating must be dry and cleaned by removing contaminants that block pores of the surface. Cleaning methods must be those recommended by the water repellent manufacturer.

Application:

The water repellent solution must be applied under the manufacturer’s instructions

The time period between applications of water repellent coating must be not less than 24 hours.

Protection: Surfaces of other materials surrounding or near the surfaces to receive the water repellent coating must be protected from overspray or spillage from the waterproofing operation. Water repellent coating applied to surfaces not intended to be waterproofed must be removed and the surfaces restored to their original condition.

99-07182D Payment

Not Used

99-07210 INSULATION (GENERAL)

99-07210A General

99-07210A(1) Summary

Scope: This work consists of installing insulation. Insulation includes related materials such as substrate boards, underlayments, vapor retarders, and cover boards.

Insulation materials must be compatible with existing or new materials incorporated in the building.

99-07210A(2) Definitions

Not Used

99-07210A(3) Submittals

Product Data:

A list of materials, manufacturer's descriptive data, location schedule, and time schedule must be submitted.

The list of materials to be used must include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

Schedules:

A location schedule and time schedule must be submitted.

The location schedule must show where each material is to be installed.

The Contractor must provide the Engineer at the job site with an accurate time schedule of the areas of the building to be insulated each day. The time schedule must be submitted 3 working days in advance of the work.

Samples: Samples of insulation material must be submitted to the Engineer at the job site.

99-07210A(4) Quality Control and Assurance

Codes and Standards: All insulating materials must be certified to comply with the California Quality Standards for Insulating Materials and must be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

99-07210A(5) Delivery, Storage, and Handling

Insulating materials must be delivered to the job site and stored in a safe dry location with labels intact and legible.

Insulating materials must be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials must be repaired or replaced.

99-07210B Materials

Not Used

99-07210C Construction

Not Used

99-716D Payment

Not Used

99-07212 BATT AND BLANKET INSULATION

99-07212A General

99-07212A(1) Summary

Scope: This work consists of installing batt or blanket insulation.

Batt insulation includes faced and unfaced batts in walls and ceilings, and exposed batt or blanket insulation for ceilings and walls.

99-07212A(2) Definitions

Not Used

99-07212A(3) Submittals

Not Used

99-07212A(4) Quality Control and Assurance

Laminator's Qualifications:

Laminator for bonding polyethylene vapor-retarder to insulating batts must be approved by the insulation manufacturer.

The name of the laminator must be submitted with the Product Data.

Codes and Standards:

All batt or blanket insulation, including facings such as vapor barriers, must have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested under ASTM E-84 or UL 723.

The flame-spread and smoke density limitations do not apply to facings on batt insulation installed between ceiling joists, or in roof-ceiling or wall cavities, provided the facing is installed in substantial contact with the surface of the ceiling.

99-07212B Materials

99-07212B(1) Insulating Materials

Fiberglass batts must be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C 665.

Wall Insulation: Wall insulation must be R-30 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation must comply with ASTM C 665, Type II, Class C.

Exposed Insulation:

Exposed insulation must be fiberglass batts with foil-paper vapor-retarder membrane on one face. Insulation must comply with ASTM C 665, Type III, Class A. Exposed insulation for ceilings must be R-30 and R-19 for walls.

Exposed insulation must be fiberglass batts with bonded polyethylene vapor-retarder membrane on one face. Insulation must comply with ASTM C 665. Type I. Exposed insulation for ceilings must be R-30 and R-19 for walls.

99-07212B(2) Vapor Retarders

Paper-laminate Vapor-retarder: Paper-laminate vapor-retarder must be kraft paper sheets laminated together with asphalt or other vapor retarding compounds, scrim reinforced at edges of sheets.

Foil-paper Vapor-retarder: Foil-paper vapor-retarder must be 0.3 mil reflective aluminum foil laminated with scrim reinforcing to plastic-coated kraft paper.

Polyethylene Vapor-retarder: Polyethylene vapor-retarder must be factory-applied, 3 mils, white polyethylene film, a blend of fiberglass and polyester yarn reinforcement, and metallized polyester film laminated with a flame resistant adhesive, and a Class I flame-spread classification.

99-07212B(3) Auxiliary Insulation Materials

Insulation Tape: Insulation tape must be that recommended by the insulation manufacturer.

Insulation Adhesive: Insulation adhesive must be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance and VOC content.

Impaling Pins: Impaling pins must be self-adhering wire pins with sheet metal retaining clips and protective rubber tips. Adhesive for pins must be that recommended by the pin manufacturer.

Line Wire: Line wire must be commercial quality 20-gage galvanized steel wire.

99-07212B(4) Shop Fabrication

Polyethylene must be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

99-07212C Construction

The vapor retarder on faced batts must be toward the interior and must be fastened to provide a sealed retarder. Punctures and holes in the retarder must be repaired.

Unless otherwise described, insulation must be kept at minimum 3 inches clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing Batt Type Insulation: Insulation batts must be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness. Installation must comply with the manufacturer's instructions and these special provisions.

Installing Exposed Insulation:

> Exposed insulation must be installed on impaling pins adhered to the substrate at 16-inch centers each direction with a minimum distance of 4 inches to the edge of the batt. Retainer clips must be placed onto the pins so that the batt is slightly compressed. Pins must be cut within ½ inch of the retaining clips and protective rubber caps placed on the ends of the pins.
>
> When line wire is shown, blankets must be supported with line wire spaced at 16 inches on center.
>
> Joints in exposed insulation must be sealed by lapping not less than 4 inches. Exposed insulation must be fastened to framing at top, end and bottom, at perimeter of wall openings and at lap joints.
>
> Overlapping joints must be sealed with insulation adhesives as instructed by vapor retarder manufacturer's printed directions. Butt joints and fastener penetrations must be sealed with insulation tape of the type recommended by the vapor retarder manufacturer. Joints at pipes, conduits, electrical boxes and similar items penetrating the vapor retarder must be sealed.

99-07212D Payment

Not Used

99-07221 RIGID ROOF INSULATION

99-07221A General

99-07221A(1) Summary

Scope: This work consists of installing rigid roof insulation.

Rigid insulation includes rigid insulation, substrate boards, underlayment, vapor retarders, cover boards, wood nailers, fasteners, and other materials required for the complete installation of the rigid insulation system. Materials and installation must be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

99-07221A(2) Definitions

Not Used

99-07221A(3) Submittals

Not Used

99-07221A(4) Quality Control and Assurance

Not Used

99-07221B Materials

Substrate Board:

Gypsum board, ASTM C 1396, Type X, 5/8 inch thick.

Glass-mat, water-resistant gypsum substrate, ASTM C 11771/4 inch, factory primed, with low permeance coating as recommended by manufacturer for intended application.

Cellulosic fiber reinforced, water-resistant gypsum substrate, ASTM C 1278,1/4 inch thick.

Perlite board, ASTM C 728, 1 inch thick.

Vapor Retarder:

Vapor retarder must have permeance of 0.1 perm or less under ASTM E 96 and must be recommended by roofing system manufacturer for intended application.

Polyethylene Film: ASTM D 4397, not less than 8 mils thick, maximum permeance 0.1 perm.

Reinforced High-Density Polyethylene: Multi-ply high-density polyethylene laminated to high-strength non-woven cord grids:

1. Weight: 40 lb./1000 sq. ft., ASTM D 3776
2. Tear Resistance: 30 lb., ASTM D 2582
3. Permeance: 0.04 perm, ASTM E 96
4. Dart Drop Impact Resistance: 500 g, ASTM D 1709
5. Tensile Strength: 100 lb/4500 psi, 3 inches, ASTM D 882
6. Puncture Strength: 33 lb., ASTM D 4833
7. Useable Temperature Range: -25 to 170 degrees F

Aluminum Foil Polyethylene Laminate: Aluminum foil core laminated to two layers of high-density polyethylene.

1. Weight: 70 lb./1,000 sq. ft., ASTM D 3776
2. Tear Resistance: 16 lb., ASTM D 2582
3. Permeance: 0.00 perm, ASTM E 96
4. Dart Drop Impact Resistance: 1800 g, ASTM D 1709
5. Tensile Strength: 105 lb/2200 psi, 3 inches, ASTM D 882
6. Puncture Strength: 50 lb., ASTM D 4833
7. Useable Temperature Range: -40 to 170 degrees F

Underlayment: Underlayment must be building paper, Type I (No. 15) asphalt roofing felt, or rosin-sized paper.

Rigid Roof Insulation: Rigid roof insulation must be multilayer, preformed board roof insulation. of one of the following types:

1. Expanded perlite board complying with ASTM Designation: C 728, Type 2
2. Wood fiber board complying with ASTM Designation: C 208, Type II, Grade 23.
   Polyisocyanurate board complying with ASTM Designation: C 1289, Type II, Class 1
4. Mineral fiber board complying with ASTM Designation: C 612, Category 2
5. Cellular glass board complying with ASTM Designation: C 552, Type IV
6. Extruded polystyrene (XPS) board complying with ASTM Designation: C 578, Type IV

7. Expanded polystyrene (EPS) board complying with ASTM Designation: C 578, Type IX

Rigid roof insulation must have R value of at least 4.6 per inch (7 total R value as installed) and compressive strength of at least 15 psi.

Cover Board:

Gypsum board, ASTM C 1396, Type X, 5/8 inch thick.

Glass-mat, water-resistant gypsum substrate, ASTM C 1177, 1/4 inch, factory primed, with low permeance coating, as recommended by manufacturer for intended application.

Cellulosic fiber reinforced, water-resistant gypsum substrate, ASTM C 1278, 1/4 inch thick.

Perlite board, ASTM C 728, 3/4 inch thick.

Insulation Tape: Insulation tape must be that recommended by the insulation manufacturer.

Bitumen: Bitumen must comply with ASTM D 312, for Type III roofing asphalt.

Adhesives, Sealants, and Primers: Adhesives, sealants, and primers must be those recommended by manufacturer for intended use.

Wood Nailers: Wood nailers must be Douglas fir, hem-fir or equivalent western softwood pressure treated after fabrication. Wood preservatives must be waterborne type.

Fastener (Wood Plank Decking): Fastener (wood plank decking) must be barbed shank or annular threaded galvanized roofing nails having one-inch minimum nominal diameter head or driven through galvanized caps; or power driven roofing staples through galvanized caps.

Fastener (Plywood Decking): Fastener (plywood decking) must be annular threaded galvanized nails having one-inch minimum nominal diameter head or driven through galvanized caps; or power driven staple driven through galvanized cap.

Fastener (Metal Decking): Fastener (metal decking) must be galvanized spring steel barbed clip driven through galvanized one-inch minimum nominal diameter caps; galvanized hardened steel nail with one-inch minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through 3-inch minimum nominal diameter galvanized cap.

99-07221C Construction

Preparation:

The preparation of the deck surfaces must comply with the manufacturer's instructions and these special provisions.

Install substrate board with long sides perpendicular to slope and with end joints staggered. Fasten to deck under the roofing manufacturer's instructions.

The deck surface must be made smooth and level.

Installation:

Underlayment must be fastened to nailable decks with randomly located roofing nails.

Install vapor retarder under the manufacturer's instructions.

Insulation panels must be placed in at least 2 layers with end joints staggered and with joints of the second layer offset at least 6 inches from joints in the first layer.

Insulation panels must be oriented with the long side perpendicular to the direction roofing felts are to be laid. End joints between panels must be staggered.

Insulation clips and fasteners must resist the wind uplift classification specified for the roof covering.

Wood nailers must be thick enough so the tops are flush with surrounding insulation. Perimeter nailers must extend at least 2 inches beyond flanges of metal flashings or gravel stops. On roofs that are steeper than 2 inches per foot, perimeter wood nailers must be supplemented by nominal 4-inch wide wood nailers installed parallel to eaves (horizontal) at a maximum spacing of 8 feet. Wood nailers must be securely fastened using at least two 16d nails to each framing member.

The first layer of insulation must be mechanically fastened as instructed by the manufacturer to meet the requirements of Factory Mutual Loss Prevention Data Sheets 1-28 and 1-29. At least one fastener per 2 square feet of insulation panel must be used. Panels that are cracked or broken by the installation of the mechanical fasteners must be replaced.

The completed layer of insulation must be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Insulation must be laid just before application of roofing felts. Units must be laid in parallel courses with transverse joints staggered, in moderate contact with adjoining surfaces.

No more insulation must be laid than can be covered with roofing the same day. Cutoffs of 2 layers of hot mopped Type I (No. 15) asphalt saturated felt must be installed, not less than 4 inches onto completed work and extended out not less than 6 inches onto the deck, at exposed edges of insulation at the end of each day's work. Cutoffs must be removed when work is resumed.

Joints in the top layer of glass fiber roof insulation must be taped with 6-inch wide felt stripping set in hot asphalt mopping.

Continuous joints between insulation units and parallel to decking flutes must not occur over the flute openings. Both units must have full edge bearing on rib tops.

Insulation panels with broken or crushed corners or edges must be trimmed free of such defects or must be discarded. Replacement boards less than 12 inches wide must not be used.

Damaged insulation in the completed work must be removed and replaced. Insulation that has been wet or is wet must be considered damaged.

Install cover board with joints staggered from joints in insulation units. Attach under the manufacturer's instructions.

99-07221D Payment

Not Used

99-07410 METAL ROOF AND SIDING

99-07410A General

99-07410A(1) Summary

Scope: This work consists of installing manufactured metal roof and siding panels.

Metal roof and siding system consists of underlayment, prefinished metal roof and siding panels, fasteners, sealants, and accessories and components required for a complete, securely fastened, and weathertight installation.

99-07410A(2) System Description

Design Requirements: The roof and siding system must comply with the wind design requirements for uplift or outward pressures complying with Chapter 16 of the CBC for the wind speed and exposure shown.

The roofing system must meet the requirements for a structural standing seam metal panel roof system under ASTM E 1514. Metal sheet roof covering systems that incorporate supporting structural members must be designed in accordance with Chapter 22, Section 1507.4 of the CBC.

99-7.04A(3) Definitions

Not Used

99-07410A(4) Submittals

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of sheathing material must be submitted.

Product data must include the manufacturer's name and a complete material description of all components of the metal sheathing system.

Samples:

Material samples must include a 12" x 12" sample of the roofing and siding panels for each color to be installed and a sample of each anchor clip and fastening device.

Shop Drawings:

Shop drawings showing the layout and details of the roofing and siding system must be submitted.

Shop drawings must include the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and weathertight joints.

Design calculations for the fastening system of the roof and wall panels with the substrate shown must be submitted to verify compliance with the design requirements.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Certificates of Compliance: Submit a certificates of compliance for the metal sheathing system.

99-07410A(5) Quality Control and Assurance

Not Used

99-07410A(6) Delivery, Storage, and Handling

Delivery and Handling: Metal panels must be protected against damage and discoloration.

Storage: Metal panels must be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

99-07410B Materials

99-07410B(1) Sheet Materials

Base Metal: Base metal must be cold formed, 0.028 inch nominal (24-gage), galvanized sheet steel complying with ASTM A 653/A 653M, Grade 33 [230] with G90 [Z275] coating, except where a higher strength is required for performance, extra smooth; or cold formed aluminum-zinc alloy-coated, commercial quality, sheet steel complying with ASTM A 792/A 792M, Grade 40 [275] with G90 [Z275] coating, extra smooth.

Configuration: Metal roofing and siding system must be a standing seam system with standing seams a minimum of 1¾ inches high and spaced not less than 12 inches nor more than 18 inches on center.

99-07410B(2) Metal Finishes

Coatings must be applied before or after forming and fabricating panels, as required for maximum coating performance capability.

Colors or color matches must be as shown or, if not otherwise shown, must be as selected by the Engineer from the manufacturer’s standard color palette.

Fluoropolymer Coating:

Finish must be the manufacturer’s standard 70 percent polyvinylidene fluoride (Kynar or Hylar) coating with a baked on primer (0.2-mil) and a finish coat of 0.8-mil nominal for a total dry film thickness of approximately 1.0-mil nominal. Coating must comply with requirements of AAMA 621.

Interior finish must consist of a 0.15-mil epoxy primer and a backer coat.

99-07410B(3) Miscellaneous Metal Shapes

Flashings: Flashings must be formed from the same material, gage and in the same finish as the metal roofing and siding panels.

99-07410B(4) Miscellaneous Materials

Fastener Clips: Fastener clips must be noncorrosive, ferrous metal fasteners of the type recommended by the metal panel system manufacturer to resist the design loads.

Fasteners: Fasteners must be those recommended by the metal panel system manufacturer. Sheet metal screws must not be used except to fasten trim and flashings.

Underlayment: Underlayment must be that recommended the metal panel system manufacturer, but not less than 30-pound minimum asphalt impregnated fiber glass mat roofing felt.

Red Rosin Sheet: Red rosin sheet must be commercial quality rosin-sized sheathing paper suitable for use as a slip sheet.

Sealant and Sealant Tape: Sealant and sealant tape must be those recommended by the panel system manufacturer.

Closures: Closures must be rubber, neoprene, closed cell plastic or prefinished metal.

99-07410B(4) Shop Fabrication

Unless otherwise shown, roof panels must be fabricated in continuous lengths for the length of the roof, from ridge or peak to eaves, except such length must not exceed the manufacturer's maximum production length.

Unless otherwise shown, siding panels must be fabricated in continuous lengths for the height of the structure, from eaves to sill, except such length must not exceed the manufacturer's maximum production length.

Flashings must be fabricated in the longest practical lengths.

Roofing and siding panels must be factory formed. Field formed panels are not acceptable.

99-07410C Construction

99-07410C(1) Installation

Underlayment: The roof and siding panels must be installed over underlayment. Underlayment must be laid parallel to the eaves, shingle fashion with 6-inch edge laps and 12-inch end laps and must be fastened as instructed by the metal roofing system manufacturer.

Roof and Siding Panels:

> The roof and siding panels must be installed and fastened under the details shown and the authorized shop drawings. Cutting and fitting must present a neat and true appearance with exposed burrs removed. Openings through roof panels must be cut square and must be reinforced as instructed by the metal panel manufacturer.
>
> Metal panels must be adjusted in place and properly aligned for the detailed conditions before fastening. Panels must not be warped, bowed or twisted. The surface finish on the panels must not be cracked, blemished or otherwise damaged.
>
> Fasteners must be concealed and must not be driven through roof panels or batten covers.

Miscellaneous Metal Shapes:

> Trim, fascia, flashings, caps, and other prefinished metal work must be positioned to the correct alignment for each detailed condition. Metal work must be securely attached to backing construction using fasteners at the spacing shown on authorized shop drawings. Prefinished metal to be installed over concrete, masonry or plaster must be back-coated with asphaltic paint as instructed by the metal roofing system manufacturer.

Metal panels, trim, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and must be replaced with undamaged units.

Expansion joints must comply with the manufacturer's instructions and to SMACNA "Architectural Sheet Metal Manual."

The metal panel system must be installed weathertight. Closures must be tight fitting and must be provided at the ends of panels, at the boundary of the roof, and as indicated on the authorized shop drawings.

99-07410C(2) Clean Up and Close Out

Clean up:

Adjacent surfaces must be protected during the roofing system installation and sealant work. Excess sealant must be removed as the installation progresses.

Roof panels, molding, trim, and other prefinished metal surfaces must be cleaned after installation as instructed by the manufacturer. Exposed cuts must be touched-up with a matching durable primer and paint as instructed by the metal roofing system manufacturer.

Touch up: Damaged paint surfaces must be touched up by using an air dry touch up paint supplied by the metal roofing system manufacturer. Only a small brush must be used for touching up. No spraying of touch up paint is to be performed.

Damaged Units: Panels and other components of the work which have been damaged or have deteriorated beyond successful repair must be removed and replaced.

99-07410D Payment

Not Used

99-07620 SHEET METAL FLASHING

99-07620A General

99-07620A(1) Summary

Scope: This work consists of fabricating and installing sheet metal flashing.

Sheet metal includes metal flashings, counterflashings, straps, roof jacks, gravel stops, reglets, copings, conductor heads, and screen type vents.

99-07620A(2) Definitions

Not Used

99-07620A(3) Submittals

99-07620A(4) Quality Control and Assurance

Codes and Standards: Sheet metal work must comply with the latest edition of the SMACNA "Architectural Sheet Metal Manual."

99-07620B Materials

99-07620B(1) General

Galvanized Sheet Steel: Galvanized sheet steel must comply with ASTM A 653/A 653M with G 90 [Z275] coating, not less than 24-gage, unless otherwise shown. Surfaces to be painted must not have factory coatings on galvanizing that cannot be removed by paint thinner.

Sheet Aluminum: Sheet aluminum must be not less than 0.032 inch thick, mill finish, 3003-H14 alloy, complying with ASTM B 209M.

Sheet Lead: Sheet lead must be not less than 0.062 inch thick, complying with ASTM B 749.

Premolded Roof Flashing: Premolded flashing must be premolded neoprene or ethylene propylene diene monomer (EPDM) flashing, resistant to ozone and ultraviolet. Units must have overlapping tab to flash the seam.

Hardware and Fastenings: Hardware and fastening for premolded roof flashings must be stainless steel.

Solder: Solder must comply with ASTM B 32, Alloy Grade Sn50 for zinc-coated steel; ASTM B 32, Alloy Grade Sn60 for stainless steel.

Soldering Flux: Soldering flux must be acid type, complying with Federal Specification: A-A-51145D, Type I, Form A.

Insect Screen: Insect screen must be industrial wire cloth and screen, medium grade, 18 mesh, 0.017-inch diameter, 0.039-inch openings, plain weave, galvanized steel .

Lap Joint Sealant: Lap joint sealant for concealed locations must be a non-drying butyl complying with ASTM C 1311.

Flashing Cement: Flashing cement must be a bituminous plastic cement, asbestos free, complying with ASTM D 4586, Type II.

Sealant: Sealant for exposed locations must be a silicone sealant complying with ASTM C 920.

Primer: Primer must be that recommended by the sealant manufacturer.

Bituminous Coating: Bituminous coating must be a cold-applied asphalt emulsion complying with ASTM D 1187.

99-07620B(2) Shop Fabrication

Sheet metal must be assembled to SMACNA standards.

Sheet metal must be formed to the sizes, shapes and dimensions shown or as described with angles and lines straight, sharp and in true alignment. The number of joints must be kept to a minimum.

Angle bends and folds for interlocking the metal must be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work must be closed watertight unless slip joints are specifically required. Watertight joints must be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals must be sealed with acrylic sealant.

Sheet metal joints to be soldered must be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints must be wiped clean of flux after soldering. Acid flux must be neutralized by washing the joints with sodium bicarbonate.

Flashings must have a 45 degree drip return at bottom edges. Unless otherwise shown, counterflashing must extend not less than 4 inches over roofing or other materials protected by the counterflashing and must be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing must be fastened by lead wedges or snap-in flashing.

99-07620C Construction

99-07620C(1) General

Preparation: Surfaces to receive sheet metal must be clean, smooth and free from defects.

Protection: Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals must be given a heavy coat of coal tar paint.

99-07620C(2) Installation

Roof Penetration Flashings:

All pipes, ducts, vents and flues passing through roofs must be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings must be fabricated from galvanized sheet steel, not less than 24-gage. Size and shape must be as shown.

The lower flashing must be galvanized sheet metal, 24-gage, and extend 6 inches minimum from outside of the pipe in all directions and 1½ inches above the top of the roofing.

The top flashing must be galvanized sheet steel or sheet lead as shown.

Premolded Roof Flashings: Premolded roof flashings must be installed under the manufacturer's instructions.

Gravel Stops:

Gravel stops must have upstanding lip, an apron with drip edge and 4-inch minimum width roof flange. Joints between lengths must be ½ inch wide sliding joints with 12-inch long internal sleeves set in plastic cement. Corners must be mitered and soldered. Gravel stops must be set in ¼-inch thick bed of plastic cement and stagger nailed at 3-inch centers on the roof flange. Nails must be one inch from the edge of the roof flange. Blind clips of galvanized steel must be provided.

After metal work is completed and watertight, flashings and gravel stops must be covered by one of the following methods:

1. The top of the stop flanges and inside the upstanding lip at the joints must be cleaned with an acid etching detergent, rinsed and dried. A ½-inch thick coat of plastic cement must be applied on the roof flange and onto the roofing at least 4 inches wide. A ½-inch thick coat of plastic cement must be applied 4 inches wide on the upstanding lip at the joints.
2. A hot mopping of roofing asphalt or a uniform coating of plastic cement must be applied, over which must be laid Type IV asphalt saturated felt strips, 10 inches and 13 inches wide, in 2 layers over the flange of the stops feathered out onto the roofing.

99-07620D Payment

Not Used

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.

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

99-08100 STEEL DOORS AND FRAMES

99-08100A General

99-08100A(1) Summary

This work consists of installing steel doors and frames.

99-08100A(2) Definitions

ANSI/SDI: American National Standards Institute/Steel Door Institute.

ANSI/NAAMM-HMMA: American National Standards Institute/National Association of Architectural Metal Manufacturers-Hollow Metal Manufacturers Association.

99-08100A(3) Submittals

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

1. Material descriptions
2. Core descriptions
3. Fire-resistance rating
4. Installation instructions for fire rated assemblies
5. Finishes
6. Construction details

Shop Drawings: Include the following:

1. Elevations of each door design
2. Details of doors, including vertical and horizontal edge details and metal thicknesses
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses
4. Locations of reinforcement and preparations for hardware
5. Details of each different wall opening condition
6. Details of anchorages, joints, field splices, and connections
7. Details of accessories
8. Details of moldings, removable stops, and glazing
9. Where electrified door hardware is described, include details of conduit and preparations for power, signal, and control systems

Door Schedule: Submit a schedule of steel doors and frames using same reference numbers for details and openings shown. Include a description of the type, location and size of each door and frame. Coordinate with door hardware schedule.

99-08100A(4) Quality Control and Assurance

Single Source Responsibility: Obtain steel doors and frames from single manufacturer.

Steel Doors and Frames: Fabricate steel doors and frames under ANSI/SDI A250.8 or ANSI/NAAMM-HMMA 861.

Hardware Reinforcement: Fabricate hardware reinforcement under ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

99-08100A(5) Delivery, Storage, and Handling

Deliver steel doors palletized, wrapped, or crated to provide protection during transit and job site storage. Do not use nonvented plastic. Furnish additional protection to prevent damage to finish.

Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

Store steel doors and frames under cover at the job site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on at least 4-inch high wood blocking. Do not store in a way that traps excess humidity.

Furnish at least 1/4-inch space between each stacked door to allow air circulation.

99-08100A(5) Coordination

Coordinate installation of anchorages for steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors.

99-08100B Materials

99-08100B(1) General

Thickness dimensions must be minimum thickness of base metal without coatings.

Steel sheet must comply with the following:

1. Cold rolled must be commercial steel, Type B, ASTM A 1008/A 1008M
2. Hot-rolled must be commercial steel, Type B, ASTM A 1011/A 1011M; free of scale, pitting, surface defects, and pickled and oiled
3. Metallic coated must be commercial steel, Type B, ASTM A 1008/A 1008M with at least A60 metallic coating complying with ASTM A 653/A 653M
4. Stainless steel must be Type 304, ASTM A 666

Frame anchors must be commercial steel, hot dip galvanized complying with ASTM A 153/A 153M.

Inserts and fasteners must be commercial steel, hot dip galvanized complying with ASTM A 153/A 153M.

Glazing must comply with section 99-08810. Glazing must be at least 3/16-inch thick.

99-08100B(2) Steel Doors

99-08100B(2)(a) General

Steel doors must be at least 1-3/4 inches thick, full flush, seamless hollow metal construction unless otherwise shown. Construct doors with smooth surfaces without visible joints or seams on exposed faces, and the following:

1. Concealed stiffeners and hardware reinforcement from steel sheet, except use stainless steel to match stainless steel face sheets.
2. Furnish beveled edge, 1/8-inch in 2 inches, for single doors. Furnish round vertical edge with 2 1/8-inch radius for double doors.
3. Astragals must be full height, 1/8-inch flat bar or folded sheet strip, at least 0.053 inches thick, and same material as face sheets. Weld on the outside of the active leaf of double doors.

99-08100B(2)(b) Exterior Doors

Exterior doors must comply with ANSI/SDI A250.4, physical endurance Level A, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.053-inch thick metallic-coated steel sheet.
2. Fabricate the steel-stiffened core using vertical stiffeners that extend full-door height. Install stiffeners not more than 6 inches apart and spot weld to both face sheets no more than 5 inches on center. Fill spaces between stiffeners with glass-fiber insulation or mineral-fiber insulation.
3. Top and bottom channels must be continuous and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.
4. Include moisture vents in the bottom channel.

99-08100B(2)(c) Interior Doors

Interior doors must comply with ANSI/SDI A250.4, physical endurance Level B, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.042-inch thick steel sheet unless metallic-coated sheet is described
2. Use the manufacturer's standard kraft-paper honeycomb core, polystyrene core, polyurethane core, or steel-stiffened core with glass-fiber or mineral-fiber insulation
3. Top and bottom channels must be at least 0.042 inch thick, same material as face sheets, and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.

99-08100B(3) Steel Frames

99-08100B(3)(a) General

Steel frames must comply with details shown for type and profile. Frames must be mitered corners, integral stop, and continuously welded unless otherwise shown.

Frames for fire rated doors must be listed and labeled for the same rating shown for the matching door.

Steel frames must be constructed as follows:

1. Interior frames from cold-rolled steel sheet unless metallic-coated sheet is described for door.
2. Exterior frames from metallic-coated steel sheet.
3. Borrowed-light frames from 0.053-inch-thick steel sheet.
4. Sidelight and transom frames from same thickness material as adjacent door frame.
5. Frames for openings 48 inches and less from 0.053-inch thick steel sheet.
6. Frames for openings wider than 48 inches from 0.067-inch thick steel sheet. Include at least 0.093-inch thick steel channel or angle stiffener head reinforcement.

99-08100B(3)(b) Frame Anchors

Jamb Anchors: Select one of the following methods to suit the wall type shown:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, at least 0.042 inch thick, with corrugated or perforated straps at least 2 inches wide by 10 inches long. For grouted frames or where shown use wire anchors at least 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud, welded to back of frames; at least 0.042-inch thick.
3. Drywall Slip-on Type: Adjustable compression anchors.
4. Postinstalled Expansion Type for Tilt Up and In-Place Concrete: At least 3/8-inch diameter bolts with expansion shields or inserts. Furnish pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

Floor Anchors: Furnish the same material as frame and at least 0.042-inch thick. Select one of the following attachment methods for the floor shown:

1. Monolithic Concrete Slab: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slab: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

99-08100B(3)(c) Stops And Moldings

Moldings for Glazed Lites in Doors: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

Fixed Frame Moldings: Form integral with steel frames, at least 5/8 inch high unless otherwise shown.

Loose Stops for Glazed Lites in Frames: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

99-08100B(4) Louvers

Louvers for interior doors must be non-vision inverted Y type. Frame must be cold rolled steel sheet at least 0.042 inches thick, mitered corners, with hidden welds. Frame screws must be on the inside.

Louvers for exterior doors must be dual security grille type. Fabricate frame and blades from metallic coated steel sheet. Fabricate grates from metallic coated steel sheet at least 0.093 inches thick. Blades must be non-vision inverted Y type. Include removable bronze mesh insect screen mounted on the inside.

Louvers in fire-rated assemblies must be factory fabricated, multi-blade adjustable fire damper type. Frame must be cold rolled steel sheet at least 0.053 inches thick, mitered corners, with hidden welds. Include a 160°F fusible link and removable bronze mesh insect screen mounted on the inside of exterior doors. Frame screws must be on the inside.

99-08100B(5) Accessories

Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

Ceiling Struts: At least 1/4-inch thick by 1-inch wide steel.

Grout Guards: Form from same material as frames and at least 0.016-inch thick.

Sealants: Sealants must be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, complying with ASTM C 920.

99-08100B(6) Fabrication

99-08100B(6)(a) General

Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at job site, clearly identify work that cannot be permanently factory assembled before shipment.

Fabricate steel doors and frames to tolerances under SDI 117 or ANSI/NAAMM-HMMA 861.

99-08100B(6)(b) Steel Doors

Furnish overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where shown. Extend at least 3/4 inch beyond edge of door on which astragal is mounted.

Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold or hot-rolled steel sheet.

Factory cut glazing and louver openings in doors.

99-08100B(6)(c) Steel Frames

99-08100B(6)(d) Frame Anchors

Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

Jamb Anchors: Unless otherwise shown, furnish number and spacing of anchors as follows:

1. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
   1.1. Two anchors per jamb up to 60 inches high.
   1.2. Three anchors per jamb from 60 to 90 inches high.
   1.3. Four anchors per jamb from 90 to 120 inches high.
2. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
   2.1. Three anchors per jamb up to 60 inches high.
   2.2. Three anchors per jamb up to 60 inches high.
   2.3. Five anchors per jamb from 90 to 96 inches high.
   2.4. Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

Compression Type Anchor: Not less than two anchors in each jamb.

Postinstalled Expansion Type Anchor: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

99-08100B(6)(e) Stops and Moldings

Furnish stops and moldings around glazed lites as follows:

1. Form corners of stops and moldings with butted or mitered hairline joints.
2. Furnish fixed stops and moldings welded on the secure side of steel doors and frames for single glazed lites.
3. Furnish fixed and removable stops and moldings for multiple glazed lites so that each glazed lite can be removed independently.
4. Furnish fixed frame moldings on the outside of exterior and on the secure side of interior doors and frames.
5. Furnish loose stops and moldings on the inside of steel doors and frames.
6. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation described.

99-08100B(7) Shop Finishes

Apply shop primer to steel doors, frames, and louvers. Use manufacturer's standard, fast-curing, lead-free and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria. Primer must be recommended by manufacturer for substrate; and compatible with field-applied coating.

99-08100C Construction

99-08100C(1) General

Examine rough-in for embedded and built-in anchors to verify actual locations before frame installation. Proceed with installation only after unsatisfactory conditions have been corrected.

99-08100C(2) Preparation

Check door frames for square, alignment, twist, and plumb before installation and adjust if necessary. Tolerances are ±1/16 inch.

Check the door frame as follows:

1. Squareness at door rabbet on a line 90 degrees from jamb perpendicular to frame head
2. Alignment at jambs on a horizontal line parallel to plane of wall
3. Twist at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall
4. Plumbness at jambs on a perpendicular line from head to floor

Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

Doors, frames, stops, molding, louvers, and accessories must be cleaned, prepared, and painted under section 99-09900 before installation.

If grout contains an antifreezing agent, field apply a bituminous coating to the backside of frames.

99-08100C(3) Installation

99-08100C(3)(a) General

Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with manufacturer's written instructions. Install fire rated assemblies under NFPA 80, the SFM, and the manufacturer's written instructions.

After installation, measure frames for squareness, alignment, twist, and plumbness under section 99-08100C(2). Adjust to meet tolerances as required.

Remove grout and other bonding material from exposed surfaces of steel doors and frames immediately after installation.

Install and fit fire rated assemblies under NFPA 80.

Install and fit smoke-control door assemblies under NFPA 105.

99-08100C(3)(b) Steel Frames

Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove spreaders and braces. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

Where frames are fabricated in sections because of shipping or handling limitations, field splice at accepted locations by welding face joint continuously. Grind, fill, dress, and make splices smooth, flush, and invisible on exposed faces.

Install frames with removable glazing stops located on the secure side of opening.

Install floor anchors for each jamb and mullion that extends to the floor and secure with expansion anchors.

Solidly pack mineral-fiber insulation behind frames set in metal-stud partitions. Fill frames in masonry or concrete walls with grout. Hand trowel grout; do not pump in. Do not allow frames to be deformed or damaged by grout forces.

99-08100C(3)(c) Steel Doors

Fit steel doors accurately in frames. Shim as necessary. Clearances must be as follows:

1. Jambs and Head: 1/8 inch ±1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch ±1/16 inch.
3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
4. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

99-08100C(3)(d) Glazing

Install glazing under section 99-08810 and the door manufacturer's written instructions. Secure stops with countersunk machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

99-08100C(4) Adjustments

Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Replace defective work, including steel doors and frames that are warped, bowed, or otherwise unacceptable.

99-08100C(5) Field Finish Repairs

After installation, clean field welds, bolted connections, and abraded areas of paint under SSPC-SP 2. Apply one coat of the same coating as applied for painting to the cleaned areas. Use galvanizing repair paint for metallic coated surfaces complying with manufacturer's written instructions.

99-08100D Payment

Not Used

99-08360 SECTIONAL OVERHEAD DOORS

99-08360A General

99-08360A(1) Summary

Scope: This work consists of installing sectional overhead doors. Sectional overhead doors must be heavy duty commercial type.

99-08360A(2) Definitions

Not Used

99-08360A(3) Submittals

Product Data:

Submit manufacturer's descriptive data, roughing-in diagram, and installation instructions for each size and type of door.

Manufacturer's descriptive data must include door panel construction and material thickness, door track size and material thickness, counterbalance spring service life, and motor operator specifications.

Materials list must contain all items to be installed.

Shop Drawings: Shop drawings must show details of special components and installations which are not fully dimensioned or detailed in manufacturer's descriptive data. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

99-08360A(4) Quality Control and Assurance

Single Source: Each sectional door must be provided as a complete unit produced by one manufacturer, including frames, sections, bracket guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit opening and head room available.

Wind Loading: Design and reinforce sectional overhead doors to withstand wind loads shown, but not less than 20 pounds per square foot, acting inward and outward, with a midspan deflection not to exceed 1/120 span.

Installer: Installer must be an authorized representative of the manufacturer.

Standards: Doors must comply with ANSI/DASMA 102 and the CBC.

Accessibility: Door and controls must comply with CBC requirements.

99-08360B Materials

99-08360B(1) Manufacturers

Available Manufacturers: Subject to compliance, manufacturers offering products which may be incorporated into the work include the following: Clopay Corp., div. Griffon Corporation; Overhead Door Corp.; Raynor Garage Doors; or equal.

99-08360B(2) Steel Sections

Door Sections:

Door sections must be galvanized commercial quality steel sheets and a minimum of G60 zinc coating complying with ASTM A 653.

Face sheets must be at least 20-gauge thick. Back sheet must be at least 26-gauge thick.

Sections must be fabricated from a single sheet to provide sections not more than 24 inches high, and nominal 2 inches deep. Meeting horizontal edges must be rolled to a continuous shiplap, rabbeted. or keyed weather seal, with a reinforcing flange return.

Intermediate and end stiles must be 16-gauge galvanized steel welded in place. Intermediate stiles must be spaced at not more than 48 inches on center.

Bottom section must be reinforced with a continuous channel or angle complying with the bottom section profile.

Insulation: Insulation must be the manufacturer's glass fiber, polystyrene or polyurethane foam type insulation and have an R-Value of at least 8.0.

Finish: Finish must be the manufacturer's standard baked enamel polyester or epoxy prime and finish coats, applied to interior and exterior faces.

99-08360B(3) Tracks, Supports, and Accessories

Door Tracks: Door tracks must be the manufacturers standard galvanized steel track system, complying with ASTM A 653 with G60 zinc coating, sized for door size and weight, and designed for the clearances shown. Complete track assembly must be provided, including brackets, bracing and reinforcing for rigid support of ball bearing roller guides, for required door type and size.

Track Reinforcement and Supports: Track reinforcement and supports must be galvanized steel complying with ASTM A 136 and galvanized under ASTM A 123. Tracks must be reinforced and supported as required for the size and weight of door to provide strength and rigidity, and to ensure against sag, sway and vibration during operation.

Door Seals: Doors must have perimeter gasket seals at head and jambs and seal must have a replaceable vinyl or neoprene bottom seal.

Vision Panels: Vision panels must be door manufacturer's standard glazed opening with safety glass, metal frame and vinyl or neoprene glazing gasket for water tight construction. The approximate size must be as shown.

Louvers: Louvers must be 2-inch deep Z-shaped blades, formed from galvanized sheet steel at least 0.028 inch thick, set in a continuous channel frame, and with a 1/4-inch mesh bird-screen in a removable frame on the inside.

Adjustable Louvers:

Adjustable louvers must be factory fabricated units of extruded aluminum alloy not less than 0.081-inch thick or galvanized steel not less than 0.040-inch thick with standard "Z" type blades set in a continuous channel frame, with a 1/4-inch mesh galvanized bird-screen in a removable frame on the inside.

Blades must have center pivot on 3/8-inch aluminum rods in stainless steel ball bearings in cadmium plated races.

Adjustable louvers must be equipped with hand-hold fixed to the operating bar for easy adjustment with wingnut spring tension to lock louvers in position.

99-08360B(4) Hardware

Hardware must be heavy-duty, rust-resistant, galvanized, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.

Hinges: Heavy steel hinges must be galvanized steel and provided at each end stile and at intermediate stiles, per manufacturer’s recommendations for size of door.

Rollers: Rollers must be heavy-duty with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Rollers must have case-hardened tires.

99-08360B(5) Counterbalance Mechanisms

Counterbalance Spring: The door must have a torsion spring counterbalance on a continuous cross header shaft made of steel spring wire complying with ASTM A 229; the entire assembly must be all-bearing mounted. The spring must have a rated service life of not less than 25,000 cycles.

99-08360B(6) Manual Door Operators

Not Used

99-08360B(7) Electric Door Operators

Door operator must be heavy duty, commercial type. Motor must be a 240-volt, 3-phase, high starting torque motor with single reduction worm gear, completely housed and running in an oil bath. Motor must be of sufficient capacity to raise and lower the door at speed of approximately 0.67 feet per second.

Door operator and assembly must be equipped with solenoid brake, limit switches for upper and lower limits of door travel, emergency hand chain with electrical interlock to break motor circuit when hand chain is engaged, 3-button operating station in a NEMA Type 4 enclosure, and a factory wired NEMA Type 1 control panel.

Control panel must contain an instrument transformer, reversing magnetic contactor with overload relay, and all necessary control relays and other devices required for complete automatic operation of the door. Motor must be removable for repair without affecting emergency operation. Motor must be centermounted or sidemounted as shown.

Reversing Door Edge: Reversing door edge must be an electrically or pneumatically operated safety device extending across the full width of the bottom of the door which must automatically the door and return to open position upon contact with any obstruction.

99-08360C Construction

99-08360C(1) General

Not Used

99-08360C(2) Installation

Door, track, and operating equipment, complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports, must be installed under the authorized shop drawings and the manufacturer's installation instructions.

Vertical track assembly must be fastened to framing at not less than 24 inches on center. Horizontal track must be hung from structural overhead framing with angle or channel hangers, welded or bolted into place. Provide sway bracing, diagonal bracing, seismic bracing, and reinforcing as required for rigid installation of track and door operating equipment.

Sealants used in installation must comply with section 99-07920.

99-08360D Payment

Not Used

99-08710 DOOR HARDWARE

99-08710A General

99-08710A(1) Summary

Scope: This work consists of installing mechanical door hardware and electrified 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.
7. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

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, fire rating, 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 CD or DVD.

Closeout documents must include the following:

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

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

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
Automatic flush bolts, panic devices, exit only devices, and coordinators	ANSI/BHMA A156.3
Door closers	ANSI/BHMA A156.4
Lock cylinders, single cylinder deadbolts and electric strikes	ANSI/BHMA A156.5
Push plates, pull plates, kick plates, and mop plates	ANSI/BHMA A156.6
Mortise locksets	ANSI/BHMA A156.13
Manual flush bolts, floor stops, wall stops, door stops, and wall bumpers	ANSI/BHMA A156.16
Materials and finishes	ANSI/BHMA A156.18
Thresholds	ANSI/BHMA A156.21
Door gasketing, automatic door bottoms, door shoes with rain drip, door sweeps, door top weatherstrips, and overhead door drips	ANSI/BHMA A156.22
Electromechanical locks	ANSI/BHMA A156.23
Keying systems	ANSI/BHMA A156.28
Electric strikes and frame mounted actuators	ANSI/BHMA A156.31
Hardware preparation in steel doors and steel frames	ANSI/BHMA A156.115
Hardware preparation in wood doors with wood or steel frames	ANSI/BHMA A156.115W

99-08710A(5)(c) Certificates

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

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: Solid tube with return. 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

99-08710B(5) Electromechanical Locks

99-08710B(6) Flush Bolts

Manual Flush Bolts: Function L04251 set or Function L02461 set as required, non handed, 1/2-inch bolt head, 3/4-inch min bolt throw, and dust proof strikes.

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

Coordinators: Type 21A, flush bolts, manufacturer's coordinated channel or filler, active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates. Include built-in, adjustable safety release.

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(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

Automatic Door Bottoms: Heavy duty, full mortise, mill finished aluminum with silicone insert, end covers, and strike plates.

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.

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.

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	Heavyweight	3
2	Mortise lockset and latch	Exit	1
3	Cylindrical auxiliary deadbolt		1
4	Lock cylinder		1
5	Operating trim		1
6	Surface closer		1
7	Mechanical stops and holders	Floor stops	1
8	Gasketing	Door sweep	1
9	Threshold		1

DOOR HARDWARE SET 2

No.	Item	Description	Quantity
1	Hinges	Heavyweight	3
2	Mortise lockset and latch	Exit	1
3	Cylindrical auxiliary deadbolt		2
4	Flush bolts		1
5	Lock cylinder		1
6	Operating trim		1
7	Accessories for pairs of doors	Astragal, coordinator	1
8	Surface closer		1
9	Mechanical stops and holders	Floor stop	1
10	Gasketing	Door sweep	1
11	Threshold		1

99-08710D Payment

Not Used

99-9 FINISHES

99-09614 DETECTABLE WARNING SURFACE

99-09614A General

99-09614A(1) Summary

This work consists of installing detectable warning surfaces.

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.

Detectable warning surface must be prefabricated, surface, 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

99-09900 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

Regulatory Requirements: Coatings and applications must comply with the rules for control of VOC emissions adopted by the Amador County Air Pollution Control District (APCD), Calaveras APCD, and Great Basin Unified APCD in the air basin in which the coatings are applied.

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 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.

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 under SSPC-SP 1. Surface profile must be as required for the coating system specified.

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

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 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.

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 the Contractor 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(4) 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(5) 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:

Flat: Latex, exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

SYSTEM 2- CONCRETE MASONRY UNIT

One Prime Coat:

Block Filler: Latex, Interior/Exterior MPI List Number 4

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 3 - GALVANIZED METAL

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

SYSTEM 4 - PREVIOUSLY COATED EXTERIOR SURFACES

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Low Sheen: Latex, Exterior, MPI Gloss Level 3/4, MPI List Number 15
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11
Gloss: Latex, Exterior, MPI Gloss Level 6, MPI List Number 119

SYSTEM 5 - PREVIOUSLY COATED INTERIOR SURFACES

2 Finish Coats:

Flat: Latex, Interior, MPI Gloss Level 1, MPI List Number 53
Eggshell-like: Latex, Interior, MPI Gloss Level 3, MPI List Number 52
Semi-Gloss: Latex, Interior, MPI Gloss Level 5, MPI List Number 54
Gloss: Latex, Interior, MPI Gloss Level 6, MPI List Number 114

SYSTEM 6 - STEEL AND OTHER FERROUS METALS, HIGHLY CORROSIVE ENVIRONMENT

2 Prime Coats:

Coating meeting the requirements of SSPC-Paint 29

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

99-09900C(6) Color Schedule

Colors must be as shown.

99-09900D Payment

Not Used

99-10 SPECIALTIES

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 § 1115B.6, and Signs and identification, § 1117B.5.

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 AND CABINETS

99-10522A General

99-10522A(1) Summary

Scope: This work consists of installing fire extinguishers with cabinets.

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 shown.

Fire Extinguisher Cabinet:

> Fire extinguisher cabinet must be factory fabricated, constructed of steel with a clear plastic panel in a steel door frame, and must have a baked enamel finish. Color to be selected by the Engineer from the manufacturer’s standard colors.
>
> Fire extinguisher cabinet must be surface mounted as shown.

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

Cabinet-mounted: Extinguishers in cabinets must be identified with letter spelling “FIRE EXTINGUISHER” applied to the cabinet door. Letter size, styles, and color must be selected by the Engineer from manufacturer’s standard arrangements.

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

99-11 EQUIPMENT

99-11140 SETTLING TANK PUMP AND PUMP VAULT

99-11140A General

99-11140A(1) Summary

Scope: The work consists of installing and testing pump and pump vault.

Settling tank pump and pump vault must include other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

99-11140A(2) Definitions

Not Used

99-11140A(3) Submittals

Product Data: Manufacturer's product date must be submitted for all manufactured materials and equipment. Manufacturer's product data must include catalog cuts, complete description, performance date and installation instructions.

Working Drawings: Working drawings for pumps and pump vault must be submitted for Engineer's approval.

Closeout Document Submittals:

Closeout documents must be furnished for the equipment before project completion.

Each closeout document must contain the following information:

1. Parts list
2. Assembly and Installation Instructions
3. Operating instructions
5. Wiring schematics
6. Pump performance curves
7. Rated capacities and accessories
8. Catalog cut sheet for all the components
9. Identification of all control and power conductors with wire numbers
10. Operation and maintenance manuals
11. Warranties and guarantees of components

Closeout documents must be submitted in the following manner:

1. Four CDs containing PDF files
2. Eight individual 3-ring binders containing paper copies

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work must be delivered to the engineer at the jobsite before contract acceptance.

Maintenance Instructions: Prior to completion of the project, one set of maintenance instructions for each pump pair, including the pump curve, must be encased between two heat-fused laminated plastic sheets, and must be attached near each pump at a convenient location approved by the Engineer.

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

99-11140A(4) Quality Control and Assurance

Codes and Standards: Duplex pumps design criteria must comply with Underwriters Laboratories, UL-778 and bear their label. The control panel design criteria must comply with Underwriters Laboratories, UL-Standard 508 for industrial controls and bear their label.

99-11140B Materials

Pump Vault: Pump vault must consist of polyethylene vault with a filter assembly consisting of 1/8 or 1/16-inch mesh filters cartridge, pumps and float tree assembly. The pump vault must be corrosion resistant. The pump vault must be configured to accept two pumps in a duplex configuration.

Duplex Pumps:

Duplex Pumps must be factory-assembled, multi-stage, centrifugal, submersible, class I, Division I, direct-connected duplex pumps. Casing must be corrosion resistant, stainless steel, 300 series with screened inlet, and vertical discharge for piping connection. Pump must have a start coil and run coil integrated in the motor. Pump must have seal electrical probes.

Pump and motor shaft must be stainless steel, with factory-sealed, grease-lubricated ball bearings or thrust bearings. Pump bearing must have a 24-hour run-dry capability.

Motor must be hermetically sealed, inverter duty rated, with built-in overload protection, and with three-conductor cable. The cable-sealing assembly for connection at pump must be provided by the pump manufacturer. Motor must be UL and CSA listed as an effluent pump. Motor must have portable Type -SO cord, or cords for pump power and control, of sufficient length to reach from the pump to motor starter enclosure without splicing. Cords must be sealed into the motor by the pump manufacturer.

Pump discharge piping must be 2-inch diameter, Schedule 40 PVC pipe, with PVC union, 150 psi PVC ball valve, 150 psi Brass or PVC check valve, and PVC flex hose with working pressure rating of 80 psig.

Float Tree Assembly:

The float switches must be UL or CSA listed for Class 1, Division 1 application and must be rated for a minimum of 5.0 amps at 120-Volt AC, single-pole, double throw fiber optic switch in inert synthetic casing. The stem must be made of PVC. Casing must be leak-proof, shockproof, and corrosion resistant. The float switch type (normally close or open) must be installed as shown. The float switches must be supplied with a pipe clamp or hinged as shown. The float switches must be adjustable and removable without removing the pump vault.

Cable must be 3-conductor, No. 18 AWG with PVC jacket. Cable must be of sufficient length to extend to the junction box, at the location as shown, without splices.

Tree assembly must be Schedule 40 PVC.

Duplex Pump Performance and Controls:

Duplex pumps will alternate and will energize and reenergize based on the float switches and the pump on and pump off floats. Alternation is on a continuous basis.

Should an effluent pump fail, the other pump will pump based on pump-on and pump-off floats, and the corresponding pump failure light will light up an alarm message, and "System Failure" must be sent by the remote telemetry system to State personnel.

Fasteners: Fasteners, including external nuts, bolts, and washers must be stainless steel unless otherwise shown.

Lifting Cable: Lifting cable must be stainless steel of adequate strength to raise and lower the pump. All related hardware must be stainless steel.

99-11140C Construction

99-11140C(1) Installation

Pump vault assembly must be installed in the tank in conformance with both the tank and pump vault manufacturer's recommendations and these specifications

Duplex Submersible Effluent pumps must be installed per the manufacturer's recommendations and in conformance with the plans.

Float tree assemblies must be preset and installed by the manufacturer to the heights required. The float switches must be mounted on a PVC tree assembly and attached to the filter cartridge. The number of floats must be as shown. Each float lead must be secured with a nylon strain relief bushing at the splice box.

99-11140C(2) Field Quality Control

Testing:

Each pump supplied must be factory tested and certified capable of pumping water, under test, according to given flow rates at the total heads indicated on the plans. Documentation of the certified test must be submitted prior to installation of the pump and must include performance curves of the pump supplied showing flow rate, total head, kilowatt rating, rpm, efficiency and the actual impeller diameter. The pump, as installed, must not load the motor to more than the actual full load nameplate amperage regardless of head.

99-11140D Payment

Not Used

99-11141 TREATED WATER TANK HEATING SYSTEM

99-11141A General

99-11141A(1) Summary

Scope: This work consists of installing and testing treated water tank heating system.

Treated water tank heating system must include other materials and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

99-11141A(2) Definitions

Not Used

99-11141A(3) Submittals

Product Data: Manufacturer’s product date must be submitted for all manufactured materials and equipment. Manufacturer's product data must include catalog cuts, complete description, performance date and installation instructions.

Working Drawings: Working drawings for treated water tank heating system must be submitted for Engineer's approval.

Closeout Document Submittals:

Closeout documents must be furnished for the equipment before project completion.

Each closeout document must contain the following information:

1. Parts list
2. Assembly and Installation Instructions
3. Operating instructions
4. Wiring schematics
5. Catalog cut sheet for all the components
6. Identification of all control and power conductors with wire numbers

7. Operation and maintenance manuals
8. Warranties and guarantees of components

Closeout documents must be submitted in the following manner:

1. Four CDs containing PDF files
2. Eight individual folders or binders containing paper copies

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

99-11141A(4) Quality Control and Assurance

Codes and Standards: Treated water tank heating system design criteria must comply with National Electrical Code article 427. The control panel design criteria must comply with Underwriters Laboratories, UL-Standard 508 for industrial controls and bear their label.

99-11141A(5) Warranty

Warranties and Guarantees: Manufacturer's warranties and guarantees furnished for materials or equipment used in the work must be delivered to the Engineer at the job site before contract acceptance.

99-11141B Materials

The treated water tank heating system includes the heating elements, heater control unit, insulation, and latex mastic coating.

Heating elements must consist of a one foot wide and eight foot long thin film printed circuit with two parallel conductor bars. Heating elements must provide uniform, low intensity heat distribution, and having no “hot spots”. The heating elements must have a release coat adhesive for mounting to the outer surface of a polyethylene tank and a aluminum ground shield on the other side for electrical protection. The thin film printed circuit must provide 40 watts of heating power per linear foot at 110 VAC. The heating elements must maintain a tank water temperature of 30 degrees F at an ambient temperature of -30 degrees F.

Heater control unit must be designed for outdoor use. The control unit must use two thermister type sensors with 13 foot leads to manage the system and tank temperature. One sensor monitors and reports the maintenance temperature. The second thermister monitors the operating temperature of the heating elements. This thermister must ensure that the heating element does not reach 130 degrees that could damage a polyethylene tank. The control panel must shut down all elements if this level is reached and then reactivate them once they have cooled one to three degrees. The control unit must provide a visual alarm should the temperature reach the maximum and a second visual alarm is provided to alert personnel if the maintenance temperature reach an unacceptable minimum (customer settable). Both alarms provide a dry contact to communicate to an external alarm device such as a bell, light or a programmable logic controller. The tank temperature must be controlled with an "on-off protocol".

Insulation must be a spray-applied rigid cellular polyurethane foam having a density of 2.0 to 3.0 pounds per cubic foot.

Latex mastic coating must be a latex paint capable of attaching and sealing the polyurethane foam from environmental damage.

99-11141C Construction

99-11141C(1) Installation

Treated water tank heating system must be installed on the tank in conformance with both the tank and heating system manufacturer's recommendations and these specifications

99-11141C(2) Field Quality Control

Testing:

The heating elements must operate up to but not exceed 130 degrees F.

The heater control unit must monitor the heating element temperature and shut down the heating elements if the temperature exceeds 130 degrees F. After shutting down the heating elements, the control unit must reactivate the elements and issue an alarm.

99-11141D Payment

Not Used

99-11230 TREATED WATER AND BRINE STORAGE TANKS

99-11230A General

99-11230A(1) Summary

Scope: This work consists of installing treated water and brine storage tanks.

Treated water and brine storage tanks must include other fittings and appurtenances, not mentioned, which are required for the complete installation of the tanks.

99-11230A(2) Definitions

Not Used

99-11230A(3) Submittals

Product Data:

Materials list for materials to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts to be submitted are as follows:

Treated water and brine storage tanks
Bulkheads
Tank drain
Tank overflow
Tank heater
Heat tape

Certificates of Compliance: Submit a certificate of compliance for manufactured products.

99-11230A(4) Quality Control and Assurance

Codes and Standards: All work must comply with the applicable portions of the California Plumbing Code, California Code of Regulations, Title 24, Part 5.

99-11320B Materials

99-11230B(1) Identification

99-11230B(2) Treated Water and Brine Storage Tanks

Treated Water and Brine Storage Tanks: The treated water and brine storage tanks (tanks) must be vertical cone top tanks constructed of high density polyethylene with U.V. inhibitors. The tanks must conform to the requirements of NSF/ANSI Standard 61. The tank walls must be green or black in color. The tanks must have an opening at the top with cover and a minimum diameter of 16 inches. The tanks must have drain fittings at the bottom of the tanks. The tanks must be 5,000 or 10,000 gallons as shown. The 5,000 gallon tanks must have a minimum specific gravity of 1.7. The 10,000 gallon tanks must have a minimum specific gravity of 1.8. The 5,000 gallon tanks must be marked with gallon indicators in increments of 500 gallons. The diameter of the 5,000 tanks must not exceed 104 inches. The 10,000 tanks must be marked with 1,000 gallon increments. The diameter of the 10,000 gallon tanks must not exceed 144 inches.

99-11230B(3) Bulkheads

Bulkheads: The bulkheads (tank adapters) must have a polypropylene body, nut and washer. The bulkheads must have a thermoplastic elastomeric gasket. The bulkheads must be supplied by the tank manufacturer.

99-11230B(4) Tank Drain

Tank Drain:

1. The tank drain must be a 2" ball valve connected to the tanks by a 2 inch pipe.
2. The 2 inch ball valve must be minimum 225 psi, polyvinyl chloride (PVC) body ball and components, fluorocarbon rubber o-rings, polytetrafluorolethylene (PTFE) seals, true union, factory mounted flanged, true block valve. The ball valve must be supplied with an operating nut.
3. The drain pipe must be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM D 2241, Type I, Grade 1.

99-11230B(5) Tank Overflow

Tank Overflow: The tank overflow must be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM D 2241, Type I, Grade 1.

99-11230B(6) Tank Heater

Tank Heater: The tank heater must be pad type, 36 by 36 inch with a grounded serpentine wound heating element meeting NEC 427.23. The heater must be 1600 watts 120 Volts

99-11230B(7) Heat tape

Heat tape: Heat tape must be 120-volt, self-regulating type heating cable with at least 30 watts per meter output and maximum maintenance temperature of 150 degrees F. Heating cable must be suitable for outdoor use and with a built-in thermostat for temperature control.

99-11230C Construction

99-11230C(1) Installation of Treated Water and Brine Storage Tanks

Treated water and brine storage tanks must be installed according to the manufacturer's recommendations.

99-11230C(2) Field Quality Control

Treated water and brine storage tanks must be tested for leakage for a minimum period of 4 hours by filling with water to the invert of the overflow drain. The system must show no visible leaks.

99-11230D Payment

Not Used

99-11235 SLOW SAND FILTER

99-11235A General

99-11235A(1) Summary

Scope: This work consists of installing three slow sand filters.

The slow sand filter must include other fittings and appurtenances, not mentioned, which are required for the complete installation of the tanks.

99-11235A(2) Definitions

Not Used

99-11235A(3) Submittals

Product Data:

Materials list for materials to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts to be submitted are as follows:

Slow sand filter tank
Slow sand filter tank frame
Bulkheads
Sand and gravel

Certificates of Compliance: Submit a certificate of compliance for manufactured products.

Submit a Certificate of Warranty issued by the tank manufacturer. Manufacturer warranties must include, but not be limited to, repair or replace brine generating system or any components that fail in materials, workmanship or that deteriorate under normal conditions within specified warranty period. Warranty period shall be a minimum of 1 year starting after the installation and training are complete. Deliver Certificate of Warranty to the Engineer.

99-11235A(4) Quality Control and Assurance

Codes and Standards: All work must comply with the applicable portions of the California Plumbing Code, California Code of Regulations, Title 24, Part 5.

99-11235B Materials

99-11235B(1) Identification

99-11235B(2) Sand Filter Tank

Slow sand filter tank: The slow sand filter tank must be a 1500 gallon cone bottom tank constructed of high density polyethylene with U.V. inhibitors. The tank walls must be translucent for level viewing. The tank must have a minimum wall thickness of 0.37 inches. The tanks must have two openings at the top with cover and a minimum diameter of 16 inches. The cone bottom must be angled at 45 degrees. The tanks must have a 2 inch drain fittings at the bottom of the tank. The diameter of the tank must not be greater than 64 inches. The tank must be marked with a minimum of 100 gallon increments above the cone bottom.

99-11235B(3) Slow Sand Filter Tank Frame.

Slow sand filter tank frame: The slow sand filter tank frame must be supplied by the tank manufacturer.

99-11235B(4) Bulkheads

Bulkheads: The bulkheads must have a polypropylene body, nut and washer. The bulkheads must have a thermoplastic elastomeric gasket.

99-11235B(5) Sand and Gravel

Sand and gravel: Sand and gravel shall be clean washed sand and gravel free from clay or organic material.

99-11235C Construction

99-11235C(1) Installation of Slow Sand Filter

Slow sand filter must be installed according to the manufacturer's recommendations.

99-11235C(2) Field Quality Control

Slow sand filter must be tested for leakage for a minimum period of 4 hours by filling with water to the invert of the overflow drain. The system must show no visible leaks.

99-11235D Payment

Not Used

99-11236 CARBON FILTER

99-11236A General

99-11236A(1) Summary

Scope: This work consists of furnishing and installing a carbon filter.

The carbon filter must include other fittings and appurtenances, not mentioned, which are required for the complete installation of the tanks.

99-11236A(2) Definitions

Not Used

99-11236A(3) Submittals

Product Data:

Materials list for materials to be used must be submitted and must include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Certificates of Compliance: Submit a certificate of compliance for manufactured products.

99-11236A(4) Quality Control and Assurance

Not used.

99-11236B Materials

Carbon filter: The carbon filter must be a 55 gallon drum or canister with a top and bottom inlet and a bottom outlet. The carbon filter must contain 200 pounds of activated carbon. The carbon must be granular, virgin coconut shell parent material, having an effective size of 0.55-0.75 mm with less than 4 percent ash, and be rated for 10 gpm with a head loss of 3 feet maximum. All bulkheads for pipe connections are to be provided by the carbon filter manufacturer.

99-11236C Construction

99-11236C(1) Installation

Carbon filter must be installed according to the manufacturer's instructions.

99-11236C(2) Field Quality Control

Carbon filter must be tested for leakage for a minimum period of 4 hours by filling with water to the outlet. The system must show no visible leaks.

99-11236D Payment

Not Used

99-12 FURNISHINGS

Not Used

99-13 SPECIAL CONSTRUCTION

Not Used

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 heating, ventilating, plumbing and liquefied petroleum gas (LPG) distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work 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, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

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:

Air separators
Boilers
Backflow preventers
Chemical feeders
Emergency eyewash and showers
Expansion tanks
Floor drains
Flow meters
Hydronic heating tubes (Cross-linked polyethylene tubes)
Industrial ventilation fans
Pressure gauges
Pumps
Pipes and valves
Plumbing fixtures and appurtenances
Radiant heat manifolds and appurtenances
Radiant heaters
Tempering valves
Thermometers
Timer switches
Valves

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. The Contractor must resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals must be submitted for the following equipment:

Boilers
Backflow preventers
Chemical feeders
Expansion tanks
Industrial ventilation fans
Pumps
Radiant heaters
Radiant heat manifolds and appurtenances
Tempering valves
Thermometers

99-15050A(5) Quality Control and Assurance

Codes and Standards: Mechanical work, including equipment, materials and installation, must comply with the CBC: CMC; CPC; IAMPO; CEC; the California Building Energy Efficiency Standards; 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.

99-15050A(7) System Identification

Piping, Ducts, Valves and Equipment:

Identification of piping, ducts, valves, and equipment must be as shown or as follows:

Above Ground Piping and Ducts: Markers must be provided on lines which are either exposed or concealed in accessible spaces. For piping systems, except drain and vent lines, indicate the fluid conveyed or its abbreviation; either by preprinted markers or stenciled markings, and include arrows to show the direction of flow. Colors must comply with ANSI Standard: A13.1. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through penetrations in floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 5-foot maximum intervals along exposed portions of the lines.

99-15050B Materials

Not Used

99-15050C Construction

Not Used

99-15050D Payment

Not Used

99-15060 PIPE, FITTINGS, AND 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)

B2:

Schedule 40 black steel pipe complying with ASTM A 53, with 150 psi black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, must be factory applied plastic. Pipe coating must be X-Tru-Coat (20-mil thickness); 3M Company, Scotchkote 6533 fusion bonded epoxy powder coating (12-mil thickness); or equal.

B3: Schedule 80 black steel pipe complying with ASTM A 53 grade B, pipe 2 inches in diameter and smaller must have 3,000 psi WOG socket welding fittings and couplings or 2,000 psi WOG threaded forged steel, ASTM A 105. Pipe 2½ inches in diameter and larger must be extra strong weight butt welding fittings and couplings.

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.

H3: Type L 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.

P7: Cross-linked Polyethylene tube (PEX) with oxygen barrier complying with ASTM F876/F877 and International Standard 9001. Tubing must be flexible thermoplastic type rated for 100 psi working pressure at 180°F. Tube must have a 25-year warranty.

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.

Insulating Connection (to Boiler): Insulating connection (to boiler) must be 6-inch minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 150 psi and a temperature of 200°F.

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.

LPG Gas Valve: LPG gas valve must be listed, 250 psi (minimum) WOG bronze ball valve. Valve must be Jenkins, Model 30-A; Crane, Accesso; Watts; 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.

Pressure Reducing Valve (PRV): Pressure reducing valve (PRV) must be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection. PRV must be completely self-contained and must require no external sending pipes or outside control medium. The outlet pressure of the PRV must be adjustable within a range of 25 psi to 60 psi.

99-15060B(3) Faucets

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

Not Used

99-15060B(5) Miscellaneous Items

Pressure Gages (for PRV) : Pressure gages (for PRV) must have 0 to 100 psi scale with 3½-inch minimum diameter dial. Gages must be installed within 6 inches of the inlet and outlet sides of the pressure reducing valve. Pressure gages must be provided with a brass gage cock.

Gas Regulator: Gas regulator must be listed as suitable for gas and equipped with full capacity relief valve, low pressure safety shut-off and weatherproof and insect proof vent for outside installation. Capacity must be as shown. Gas regulator must be Fisher; Reliance; Rockwell; or equal.

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.

Backflow Preventer: Backflow preventer must be factory assembled with 2 check valves, one pressure differential relief valve, 2 ball valves and 4 test cocks. Backflow preventers must be approved reduced pressure principle devices listed by the County of Los Angeles Department of Health Services, Environmental Health, Cross-Connection and Water Pollution Control Program, 5050 Commerce Drive, Baldwin Park, California 91706, Telephone (626) 430-5290.

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.

Valve Box: Valve box must be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension must be provided as required. Valve box must be Christy, B24; Brooks Products Company, Dual-11; BES, C24W; or equal.

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. Floor drain must be round or square as shown. Floor drain must be J R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

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 (CW and HW) in buildings	H3
Domestic water underground within 5 feet of the building	H2
Hydronic piping (except in slab)	H2
Hydronic floor tubing in slab	P7
Liquefied petroleum gas (LPG), 125 psi or less, above ground	B2
LPG, 125 psi or less, underground	B2 (plastic coated)
LPG, exceeding 125 psi	B3
Equipment drains and relief valve discharge	H3

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.

Piping must be installed parallel to walls. All obstructions must be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping must not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe must be provided. Space must be caulked water tight with silicone sealant.

Underground copper pipe must have brazed joints. Underground plastic pipe must be buried with No. 14 solid bare copper wire. Wire ends at pipe ends must be brought up 8 inches and looped around pipe.

Piping and tubing for hydronic heating must be installed under section 99-15510.

Gas piping must not be installed under building concrete slabs or structure. An insulating connection and valve must be installed above ground at each building supply.

Gas piping must be pitched to equipment or to low point and provided with an 8-inch minimum dirt leg.

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.

Pipe Sleeves:

The Contractor must provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces must be patched to match existing.

PVC pipe sleeves must be provided where each pipe passes through concrete floors, footings, walls . Inside diameter of sleeves must be at least ¾ inch larger than outside diameter of pipe. Sleeves must be installed to provide at least 3/8-inch space all around pipe the full depth of concrete. Space between pipes and pipe sleeves must be caulked watertight.

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.

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.

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
½” to 2”	3/8”

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.

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, and gas 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, and gas 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 boiler .

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

Pressure Reducing Valve: A capped tee connection and strainer must be installed ahead of the pressure reducing valve.

Exterior Valves: Exterior valves located underground must be installed in a valve box marked "Water." Extensions must be provided as required.

99-15060C(3) INSTALLATION OF FAUCETS

Hose Faucet : Faucets must be installed with outlets 18 inches above finished grade.

99-15060C(4) INSTALLATION OF CLEANOUTS

Not Used

99-15060C(5) INSTALLATION OF MISCELLANEOUS ITEMS

Gas Appliance Connection: Gas valve and flexible connector must be provided for gas piping at each appliance. Appropriately rated gas cocks may be used in ½-inch gas pipe. Cock or valve must be within 3 feet of the appliance.

Gas Regulator: Gas regulator must be installed complete with dirt leg, capped test tee, union, insulating union, gas valve and fittings.

Backflow Preventer:

Backflow preventer assembly must include a wye strainer, backflow preventer, fittings and pipe. Assembly components must be the same size as the pipe in which they are installed unless otherwise shown.

Backflow preventer must be installed a minimum of 12 inches above ground and must be the same size as the pipe in which it is installed unless otherwise shown.

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:

The Contractor 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.

The Contractor 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:

The Contractor 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. The Contractor must furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor 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.

The Contractor must take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor must repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

General Tests:

All piping must be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems must show no loss in pressure or visible leaks.

The Contractor must test systems under the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Water	125 psig	Water
Gas (except P6)	100 psig	Air
Gas (P6)	50 psig	Air

During testing of water systems, valves must be closed and pipeline filled with water. Provisions must be made for release of air.

Test Procedures:

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.

Water Systems: When roughing in is completed and before fixtures are set, test 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 such as emergency eyewash and shower and boiler which may be damaged if subjected to full test pressure.

Testing Backflow Preventers:

Backflow preventers installed by the Contractor must be tested at the completion of the supply system installation for proper operation by a certified Backflow Preventer Tester.

The tester must hold a valid certificate as a Backflow Preventer Tester from the county in which the device to be tested is located or, if the county does not have a certification program for Backflow Preventer Testers, the tester must have a certificate from one of the following:

1. The American Water Works Association.
2. A county which has a certification program for Backflow Preventer Testers. The certification under which the tester has been certified must be acceptable to the water purveyor and the local agency having jurisdiction.

Testing for proper operation must comply with the procedures of the county in which the testing is being performed, or, if such procedures are not available in the county, such tests must comply with registration and guidance available from the California Department of Public Health, Division of Drinking Water and Environmental Management, Drinking Water Program, 1616 Capital Avenue, P. O. Box 997377, MS 7400, Sacramento, CA 95899, www.cdph.ca.gov/programs/Pages/DWP.aspx .

The Contractor must notify the Engineer at least 5 days prior to testing backflow preventers. Such tests must be satisfactorily completed after installation of the backflow preventer assemblies and before operation of the systems.

One copy of all test results for each backflow preventer must be furnished to the Engineer.

Full compensation for providing the certified Backflow Preventer Tester and for testing the backflow preventers must be considered as included in the lump sum price paid for building work and no additional compensation will be allowed therefore.

99-15060D Payment

Not Used

99-15250 MECHANICAL INSULATION

99-15250A General

99-15250A(1) Summary

Scope: This work consists of installing mechanical insulation.

Piping insulation must be installed on all water piping, above grade.

Piping insulation must be installed on all hydronic supply and return piping, above and below grade .

99-15250A(2) Definitions

Not Used

99-15250A(3) Submittals

Test Reports: Certified test reports signed by Contractor and supervisor who performed testing work.

99-15250A(4) Quality Control and Assurance

Codes and Standards:

Mechanical insulation must comply with California State Energy Commission regulations and, where applicable, must meet ASTM standards.

All materials must bear the label of UL or other approved testing laboratory indicating that the materials proposed for use comply with the required fire hazard ratings.

99-15250B Materials

All pipe insulation and wrapping material, located within buildings must be certified to have a composite flame spread rating of not more than 25 and smoke development rating of not more than 450 when tested under ASTM E 84.

Water and Interior Hydronic Piping Insulation: Piping insulation must be glass fiber molded pipe insulation with factory applied jacket suitable for service temperatures up to 350°F. Covering jacket must have pressure sealing lap adhesive joints. Pipe insulation must have a minimum thermal resistance of R-3. Insulation and jackets must be Owens-Corning, Fiberglass Pipe Insulation with ASJ/SSL All Service Jacket; Manville, Micro-Lok with AP-T All Purpose Jacket; or equal.

Piping Insulation Cement: Insulation cement must be Fenco, All Purpose Cement; Manville, JM375; or equal.

Exterior and In Ground Hydronic Piping Insulation: Piping insulation must be polyurethane foam insulation with a service temperature range of 32°F to 250°F. A 6-mil vapor barrier must be applied over the top off the insulation. The vapor barrier must be installed with an adhesive as recommended by the manufacturer.

Adhesive: Adhesive must be non-flammable type, water-based, high solids, fast-tacking, pressure-sensitive adhesive recommended by manufacturer for use with insulation, with VOC content not to exceed 50 g/L.

Insulation Inserts: Insulation inserts at pipe hangers supports for pipes 2 inches or larger must be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 13-pound density.

99-15250C Construction

Insulation materials must be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material must not be installed until all pipes or surfaces to be covered are tested for leaks, cleaned and dried, and foreign materials, such as rust, have been removed.

Piping Insulation:

Piping insulation must comply with the following, except that unions, unless integral with valves, and flexible connections must not be insulated:

1. Where insulation butts against flanges or is discontinued, insulation must be tapered to pipe to allow for covering jacket to completely seal off end of insulation.
   Insulation must be extended on the valve bodies up to the valve bonnet.
   Extend insulation continuous through pipe hangers and pipe sleeves. At hangers where pipe is supported, provide an insulated protection shield.
   Insulating cement must be applied to fittings, valves, and strainers and troweled smooth to thickness of adjacent covering. Strainer cleanout plugs must remain accessible. Covers fabricated from molded pipe covering may be used in lieu of cement, provided covers are neat and well secured.
2. In-ground insulation must have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket must be made watertight with adhesive or sealant as recommended by the PVC jacket manufacturer.

99-15250D Payment

Not Used

99-15441 PLUMBING FIXTURES

99-15441A General

99-15441A(1) Summary

This work consists of installing plumbing fixtures and other equipment in buildings.

99-15441A(2) Definitions

MaP: Maximum Performance Testing Program, http://www.map-testing.com.

99-15441A(3) Submittals

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

1. Manufacturer's technical information and catalog cuts for each item. Indicate model numbers, water consumption, required options, size, and finish.
2. Fasteners, carriers, supports, and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. NSF 61 certification where required.
5. Maintenance and operating instructions, including spare parts list.

99-15441A(4) Quality Control and Assurance

99-15441A(4)(a) General

The Engineer will inspect all fixtures for proper installation and test for proper operation after all plumbing activities are complete.

99-15441B Materials

99-15441B(1) General

Plumbing fixtures must be all stainless steel construction.

99-15441B(6) Miscellaneous Equipment

Emergency Eyewash and Showers:

Emergency eyewash and showers must be all stainless steel construction, combination drench shower and eyewash, with 1-1/4 inch stainless steel pipe stand with 9-inch stainless steel floor mounting flange. Stainless steel drench shower heads must have a stay-open stainless steel ball valve operated by a rigid pull-rod with triangular handle and equipped with 8-1/2 by 11 inch emergency identification sign complying with section 7.4.3 of ANSI Z 358.1.

Eyewash units must have a at least a 10-inch diameter stainless steel bowl, with stainless steel anti-surge heads and circular stainless steel spray ring operated by a stainless steel stay-open ball valve, stainless steel 50 x 50 mesh water strainer, equipped with stainless steel ball and stem, operated by a flag or push handle. Eyewash units must be mounted on the stainless steel pipe stand and include a dust cover assembly.

Emergency eyewash and showers must comply with 8 CA Code of Regs § 5162 and must be designated accessible and barrier-free by the manufacturer.

Sealant: Sealant must be:

1. One component, low modulus silicone
2. Non-acid curing
3. Designed for plumbing fixture applications
4. Compliant with ASTM C 920
5. Not subject to sag or flow and tack-free in 1 hour
6. Capable of 100 percent extension and 50 percent contraction without failure

99-15441C Construction

99-15441C(1) General

Seal fixtures to the wall and floor with sealant bead.

99-15441C(2) Installation

Install emergency eyewash and shower with a rigid bracket located 48 inches above the floor. Bracket must be at least 16-gauge stainless steel and attached to the wall.

99-15441D Payment

Not Used

99-15485 LIQUEFIED PETROLEUM GAS (LPG) SYSTEM

99-15485A General

99-15485A(1) Summary

Scope: This work consists of installing a liquefied petroleum gas (LPG) distribution system.

The LPG distribution system must include an LPG storage tank, LPG vaporizer, pipe, fittings, valves and such other system components necessary for the proper installation and operation of the LPG system.

Permits: The Contractor must obtain the required permits to operate pressure vessels in compliance with the requirements of the State Division of Industrial Safety (DIS), must pay the costs for such permits, and must perform all required tests. Such permits must be posted under glass at the site of the work.

99-15485A(2) Definitions

Not Used

99-15485A(3) Submittals

Submit concrete foundation working drawings for review and approval prior to installation of LPG tank and LPG vaporizer.

99-15485A(4) Quality Control and Assurance

Codes and Standards: All work performed and materials installed must comply with the requirements in the California Building Standards Code, Title 24, Part 4 and Part 5; the California Code of Regulations, Title 8, Chapter 4, Subchapter I, Article 5; and National Fire Protection Association (NFPA) Standard No. 58-2001.

99-15485B Materials

Tank: Tank must be constructed and stamped for 250 psig working pressure under the ASME Code for "Unfired Pressure Vessels for Petroleum Liquids and Gases." Tank must have certification of testing for 375 psig. Tank must include a rainhood, with top opening for relief valve and welded steel supports with provisions for bolting to the concrete foundation. Tank must be painted white.

Tank Valves, Fittings, Regulators and Accessories: Tank valves, fittings, regulators and accessories must be UL listed and labeled. Valves, fittings, regulators and accessories must be as required by the California Codes listed above and must be Rego, Fisher, Rockwell, or equal.

Pipe and Fittings (at the Tank and Underground): Pipe and fittings must comply with section 99-15060.

Warning Signs: Warning signs must be sheet steel, not less than 0.048 inch thick (18-gage) with a baked enamel coating and must have red letters on a white background.

LPG Vaporizer: LPG vaporizer must be direct-fired, self contained, thermostat control, built in a rugged heavy gauge metal enclosure with power coat applied over zinc plating to protect against harsh environments, stainless steel exhaust flue with domed exhaust top combined with flue collar, and stainless steel tubing. Unit shall be provide with compact thermostat with built-in 9V battery re-ignitor. Vaporizer must be ASME approved and UL listed.

99-15485C Construction

99-15485C(1) Installation

The LPG tank and system components must be installed under NFPA Standard No. 58-2001, the manufacturer's instructions, and the authorized installation drawings.

Foundation:

The tank must be installed on a concrete foundation. The tank installation must include seismic restraint and provisions for expansion and contraction. Neoprene or asphalt impregnated felt anti-corrosion pads must be installed between the saddle and the concrete foundation.

The LPG vaporizer must be installed on a concrete foundation. The vaporizer installation must include seismic restraint and provisions for expansion and contraction.

The concrete foundation must be constructed under section 99-03300.

All openings must be capped until ready for field connections. Piping must be supported adequately, with allowance for swing joint movement.

Piping Installation:

Piping must be buried a minimum depth of 36 inches . Insulating unions must be installed at least 6 inches above grade between the coated pipe and the above ground pipe lines.

Joints for underground piping must be cleaned, primed and wrapped under section 99-15060. The cleaning, priming and wrapping of pipe joints must be completed after testing the piping system.

Coated Pipe Inspection: The coating on all coated pipe must be inspected for flaws prior to any testing, and must be reinspected after testing and before the cleaning, priming and wrapping of the joints.

Tank Finish:

If the tank coating substrate is damaged during installation, the tank must be repaired to its original condition at the expense of the Contractor.

The word "FLAMMABLE" must be painted on each side of the tank. Sign lettering must be standard-type not less than 4 inches in height. The lettering color must be red.

Warning Sign Installation and Application: Four warning signs with the words "NO SMOKING, OPEN FLAMES OR OTHER SOURCE OF IGNITION PERMITTED WITHIN 50 FEET" must be placed on four sides of the tank. Sign lettering must be standard-type not less than 1½ inches in height. The lettering color must be in sharp contrast to the color of the sign.

99-15485C(2) Field Quality Control

Testing:

After construction, installation and pipe testing, the LPG system must be pressure tested with air or nitrogen. The system must be tested for a minimum time period of 30 minutes at 200 psig. If any leaks are detected during the test, the system must be repaired and retested until no leaks are detected.

After the pressure tests have been completed, the LPG system must be purged 5 times with methanol (methyl alcohol), using one gallon per 1,000 gallons water capacity, to remove moisture from the system.

After testing and purging the system, the tank must be filled to 25 percent of the water capacity of the tank, measured in gallons, with Department-furnished LPG.

An operational test must be performed on the LPG system upon completion of the pressure tests, the purging of the system and the delivery of the Department-furnished LPG fuel. The operational test must consist of operating all LPG equipment for a period of three 24-hour days.

99-15485D Payment

Not Used

99-15500 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

99-15500A General

99-15500A(1) Summary

Scope: This work consists of installing and testing heating, ventilating and air conditioning (HVAC) equipment and systems.

The performance rating and electric service of the HVAC equipment must be as shown.

Temperature Controls: Temperature controls including thermostats, relays, timer switches, and other sensor type control devices required for this work must be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring must be installed under section 99-16.

Codes and Standards:

Comply with codes and other requirements specified under section 99-15050.

Equipment and systems must comply with California Energy Commission regulations including the California Building Energy Efficiency Standards and the Appliance Efficiency Regulations and, where applicable, must comply with standards of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association International (AMCA). Gas-fired equipment must be CSA certified as complying with applicable ANSI standards.

Performance of space heating and hydronic heating equipment and component must be certified by AHRI under the GAMA, I=B=R, ARI, or AHRI rating systems as applicable.

Safety: Equipment must be certified compliant with UL 1995 or with ASHRAE 15, NFPA 90A, and NFPA 90B.

99-15500A(2) Definitions

Not Used

99-15500A(3) Submittals

Product Data: Submit product literature and installation instructions for all products and accessories. Include annual fuel utilization efficiency (AFUE) for gas-fired heating equipment.

99-15500A(4) Quality Control and Assurance

Not Used

99-15500B Materials

99-15500B(1) Heating and Cooling Units

Radiant Heater:

Radiant heater must include power burner, radiant tube, combustion air intake and flue through wall kits, reflector, controls, hangers, and appurtenances as necessary for proper installation and operation, and all the components must be stainless steel and radiant heater manufacturer's recommendation. System must be CSA certified and rated for LPG.

Burner must be equipped with direct spark ignition with water-resistant solid state circuitry are incorporated, flame safety control and combustion chamber inspection sight glass.

Radiant heater controls must consist of gas and burner controls.

Reflectors, hangers, supports and fasteners must be stainless steel and must comply with the radiant heater manufacturer's instructions.

99-15500B(2) Fans and Ventilators

Industrial Ventilation Fan (Wall Mounted):

Industrial ventilation fan must be wall mounted, propeller type, AMCA certified, direct drive, aluminum blades, metal housing, venturi orifice, and safety grills. Industrial ventilation fan must be constructed under the requirements of AMCA Publication 99, "Standards Handbook." Fan must be Greenheck, Acme, Loren Cook, or equal.

Fan motor and fan assembly must be isolated from base with rubber vibration isolators. Fan motor must be 3-phase, continuous duty and explosion proof with integral thermal overload protection.

Industrial ventilation wall fan must be supplied with wall mount collar, motor side guard, backdraft damper and weather hood. Weather hood must be stainless steel with bird screen. All parts must be supplied by the fan manufacturer.

99-15500B(3) HVAC Controls

Radiant Heater Thermostat: Radiant heater thermostat must be low voltage type, single set point range internally adjustable from 40°F to 80°F, and provided with a watertight stainless steel blank cover.

Time Switch: Time switch must be two-hour, spring-wound, "OFF" type time switch without a "HOLD" feature. Time switch must be watertight.

99-15500B(4) Auxiliary HVAC Components

Vents and Flues (for Heaters): Vents and flues for heaters must be approved Type B.

99-15500C Construction

99-15500C(1) Installation

Heaters:

Radiant heaters must be installed in such a manner as to insure adequate furnace clearance, support radiant heater assemblies from wall and submit supporting system for approval and install as per manufacturer's recommendations. Appliances must be connected to a rigidly mounted gas pipe supply system by a CSA approved flex connector and gas valve.

Mounting Heights: Thermostats and time switches must be installed as consistent with accessibility requirements.

Temperature Controls:

Temperature control for radiant heater must be provided by 2 low voltage thermostats and a time switch. One thermostat must be set at 45°F for low-limit temperature control and the second thermostat must be set at 55°F. The first thermostat must energize the heater whenever the temperature is below the setpoint. The second thermostat must be wired in series with the time switch and must de-energize the heater above the setpoint. Thermostats and timer switches must be watertight.

Install thermostats on interior walls. If installation on an exterior wall is unavoidable, each thermostat installed on an exterior wall must be insulated from the outside wall, and must be provided with an aluminum radiation shield above the thermostat.

The time switch must be installed beside the thermostat.

Vents and Flues: Vents and flues must be securely fastened to the building construction, and must terminate with a weather cap fabricated of the same material (stainless steel).

99-15500C(2) Field Quality Control

Pre-test Requirements:

Before starting or operating systems, equipment must be cleaned and checked for proper installation, lubrication and servicing.

The Contractor must replace or revise any equipment, systems or work found deficient during tests.

Project Completion Tests:

The Engineer must be notified at least 3 working days in advance of starting project completion tests.

Upon completion of mechanical work and pre-test requirements, or at such time prior to completion as determined by the Engineer, the Contractor must operate and test installed mechanical systems for at least 5 consecutive 24-hour days to demonstrate satisfactory overall operation.

99-15500D Payment

Not Used

99-15510 HYDRONIC HEATING SYSTEM

99-15510A General

99-15510A(1) Summary

Scope: This work consists of installing and testing a hydronic heating system.

Piping and tubing for hydronic heating must comply with section 99-15060.

Thermostats, relays, time switches, snow senders and other sensor type control devices required for this work must be installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring must be installed under section 99-16.

99-15510A(2) Definitions

Not Used

99-15510A(3) Submittals

Not Used

99-15510A(4) Quality Control and Assurance

Codes and Standards: Equipment and systems must comply with California State Energy Commission Regulations and, where applicable, must be Air-Conditioning, Heating, and Refrigeration Institute (AHRI), CSA International, Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown.

99-15510B Materials

Pumps:

Pumps must be close coupled type with non-overloading characteristics. Pumps must not overload the motor above its horsepower rating under any operating conditions with the ratings based on continuous operation. Motor sizes shown are estimated minimum requirements and larger motors must be furnished if necessary to meet non-overloading requirements. Motors must have built-in overcurrent protection.

Pump material must be compatible with the working fluid, and must be sized to meet the operating requirements specified.

Pumps must not be connected to the piping before the piping is thoroughly flushed and cleaned of dirt and grit. After the connections have been made, the system must be filled before starting the pumps. Pumps must not be run dry under any circumstances.

Piping must be supported from the building structure to prevent strain on the pump casings. A final check for alignment of the piping connections must be made after the pump has been secured.

Pumps must be Grundfos, Bell and Gossett, or equal. Pumps must be designed especially for these type of installations. Each pump must have a cast iron case, bronze impeller, mechanical seal, flexible coupling and flanged connections to permit easy removal of the complete unit from the piping system.

Chemical Feeder: Chemical feeder must be bypass feeder, pot type with one-gallon minimum capacity. Feeder must be provided with union and ball valve on both the supply and return lines, configured as recommended by the manufacturer.

Expansion Tank: Expansion tank must be of welded steel construction and must be ASME inspected and stamped for 125 psi working pressure. The tank must be equipped with drain valve, air charging valve, and gauge glass. Expansion tank must have the capacity shown.

Gauge Glass: Gauge glass must be ½ inch in size and of adequate length to indicate the entire contents of the tank. The gauge must be an automatic type with drain cock and must be valved top and bottom to allow changing the glass without draining the tank.

Radiant Heating Manifold: Radiant heating manifold must be bronze construction. Each supply and return manifold must have balancing valves, thermostats and drain lines with ball valves. Return manifold must have automatic air vents, balancing valves and flow meters (0 to 1 GPM) for each of the heating tube connected to it for balancing the flow rate of each loop.

Air Separator: Air separator must be furnished and installed as shown and must be rated for 30 gallons per minute. Air separator must be constructed for 125 psi working pressure and comply with ASME boiler and pressure vessel code. Air separator must be Amtrol, Bell & Gossett, or equal.

Balance Valves: Balance valves must be as specified for “ball valve” elsewhere in these special provisions. Valves must have removable handles.

Flow Meter:

Flow meter must be in-line, direct reading, see-through type, rated for 180°F temperature and 125 psi working pressure with accuracy to within 2 percent of full scale reading.

Flow meter on pumps 1A and 1B discharge must have maximum scale range of 40 gallons per minute (GPM). Flow meter on pumps 2 and 3 discharge must have maximum scale range of 20 GPM. Flow meter on pump 4 discharge must have a maximum scale range of 15 GPM. Flow meter on the circuit balancing loop must have a maximum scale range of 5 GPM.

Flow meter must be Blue-White Industries, Hedland Products, or equal.

Tempering Valve: Tempering valve must be self-actuated, rated at 125 psi working pressure at 200°F with wrench operated adjustable temperature range set for an outlet temperature as shown, rough bronze construction and bronze trim with union angle strainer and check stops on inlet. Pressure drop across the valve must be a maximum of 1.5 psi at 20 GPM. Valve must be both temperature and pressure compensating.

Thermometer:

Thermometer must be liquid dial type, minimum 5-inch diameter, with 2°F graduations and a temperature range that includes 30°F and 175°F.

Accuracy must be within ± one percent.

Thermometer must be provided with extension neck or stem such that the thermometer face is above the surface of insulation or other materials.

Liquid thermometer must be designed for and be installed in a thermowell which projects into the flow stream and is completely immersed in liquid. The thermowell must prevent system fluid loss when the thermometer is removed. Pipe size must be increased at the thermowell where necessary to allow for full flow without excessive resistance.

Thermocouple: Thermocouple must be Type J, high temperature, ceramic filter insulated thermocouple with nickel alloy overlaid.

Temperature Process Controller: Temperature process controller must be 120-volt, 60 Hz, dual universal input programmable process controller with a least 4 output relays, one normally closed contact and one normally open contact. Relay must be rated for 5 amperes (continuous) at 120 volts. Process controller must have dual readouts, one for sensed temperature, and one for the setpoint temperature. Process controller must operate using a proportional automatic reset/integral or heat derivative control that can be auto-tuned.

Pressure Gage: Pressure gage must be ANSI Standard: B40.1, Grade A, 4½-inch minimum diameter dial, liquid filled with cover, plain case, reset screw, ¼-inch NPT bottom inlet. Gage must read from 0 psig to 20 psig. Each pressure gage must be equipped with a gage cock.

Gage Cocks: Gage cocks must be ¼ inch, brass or bronze, 150 psi rated with female and male threaded ends, and tee handle. Gage cocks must be installed at each pressure gauge.

Air Vent Valves: Air vent valves must consist of ball valves and copper tubing connected to the top of all high points in the hot water system. Tubing must be ¼ inch and must extend down to easily accessible ¼-inch globe valves mounted approximately 5 feet above the floor. The ¼-inch tubing must discharge to the building floor and must terminate 6 inches above finish floor.

Automatic Air Vent: Automatic air vent must consist of a brass body construction with female NPT connection, brass cover, air vent with silicone rubber seal, polyethylene float with valve plug, and automatic vent. Automatic air vent must be rated for high temperature (200°F) and pressure (150psi) and must be able to separate and release air from 35% propylene glycol solution.

99-15510C Construction

99-15510C(1) Installation

Installation of Pipe and Tubing:

Installation of all heating water supply and return pipe and tubing must comply with the requirements for cutting, cleaning, closing, securing and insulating of water piping under section 99-15060.

Heating water supply and return sections which are cast into the concrete floor slab at each circuit balancing valve box must consist of a continuous section of wrapped Type L, soft drawn copper tubing. No fitting or joint must be cast in the concrete slab. Unions must be installed at both ends of heating water supply and return tubing which are cast in the slab as shown.

Heating water floor coil layout must comply with the details shown. The spacing between tubing runs must be 9 inches on center. Vertical clearance from the surface of the slab to the tubing must be as shown. The minimum radius for tubing bends must be 5 inches.

Floor coil tubing must be laid in continuous lengths with no splicing. Tubing must be secured directly to the bar reinforcement using nylon ties located at 10-foot intervals along straight runs, at the mid-point of each radius on bends and at other locations as directed by the Engineer.

The piping system in the floor slab must be tested prior to placing concrete. The compressor, pump, gauges, and other materials or equipment required for testing the piping systems must be installed by the Contractor.

The piping must be visually leak tested with water at 100 psig for 4 hours prior to the placement of the slab concrete. At the conclusion of the water testing, the floor slab concrete must be placed. The water pressure must be maintained in the piping system during the concrete placement operation. Leaks that develop in the pipe must be replaced immediately. The water pressure must be released 2 hours after completion of the concrete placement and repressurization must not take place until the concrete has attained sufficient strength to resist the piping expansion as determined by the Engineer.

The ends of the in-slab pipe risers must remain capped and protected from damage. After the above slab portion of the supply and return piping has been installed and tested, both systems must be flushed with clean, potable water and then connected.

The completed above and below slab systems must be pressure tested using water pressure at 100 psig for 8 hours. The system must show no loss in pressure. At the conclusion of the pressure test, the system must be filled with a 50-50 solution of glycol and water.

The Contractor must be responsible for freeze protecting all piping prior to the completion of the hydronic system.

99-15510C(2) Field Quality Control

Pre-test Requirements:

Before starting or operating systems, equipment and controls must be cleaned and checked for proper installation and operation.

Each separate circuit must have the flows balanced and recorded. The pumping rate for each pump must be adjusted to the value shown.

Final adjustments and balancing of the systems must be performed in such a manner that the systems will operate as specified and as shown.

The Contractor must replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned system must be set and adjusted to deliver the required performance at temperatures specified by the Engineer. All control work must be done in collaboration with the control manufacturer's representative.

Acceptance Testing:

Prior to completion of hydronic system installation, and before permitting use of the system, the Contractor must fire the boiler and demonstrate all operating and safety controls in the presence of the Engineer.

The Contractor must notify the Engineer at least 3 days in advance of the dates and times tests are to be performed.

Upon completion of mechanical work and pre-test requirements, or at such time prior to contract acceptance as determined by the Engineer, the Contractor must operate and test the complete hydronic heating system for at least 5 consecutive 24-hour days to demonstrate satisfactory overall operation.

99-15510C(3) Instruction and Maintenance

Instruction:

The Contractor must instruct State personnel in the proper use, operations and daily maintenance of the hydronic heating system, including the boiler.

Emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies, must be reviewed.

State personnel must be trained in normal procedures to be followed in checking sources of operation failures or malfunctions.

Immediately prior to substantial completion, the Contractor must conduct a final inspection with State personnel present to determine that control systems and operating devices are operating properly.

Project Completion Tests:

The Engineer must be notified at least 3 days in advance of starting project completion tests.

The project completion tests must consist of the following:

During the test period the following data must be measured and recorded twice a day:

1. Ambient temperature and conditions.
2. Circulating fluid flow through each pump.
3. Slab and air temperature in the entrance and exit aprons, wash pad, equipment room, sump pit and sump ramp.

The measurements must be taken prior to 7:00 a.m. each morning, at 1:00 p.m. and after 6 p.m. each afternoon.

At the completion of the test period, the flow rates for each individual circuit of the radiant heating system must be recorded. Flow rate data must be tabulated and submitted to the Engineer at the job site for authorization.

99-15510D Payment

Not Used

99-15555 BOILER

99-15555A General

99-15555A(1) Summary

Scope: This work consists of installing and testing the LPG fired boiler, equipment and systems.

Temperature Controls: Thermostats, relays, time switches, and other sensor type control devices required for this work must be installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring must be installed under section 99-16.

99-15555A(2) Definitions

Not Used

99-15555A(3) Submittals

Not Used

99-15555A(4) Quality Control and Assurance

Installer's Qualification: Installation of the boiler must be by the boiler manufacturer or a licensee of the manufacturer, who has not less than 5 years successful experience with the installation of similar boilers and who maintains a service facility within 50 miles of the job site.

Codes and Standards: The boiler's construction is in accordance with ANSI Standard for Gas Fired Low-Pressure steam and Hot Water Boilers, ANSI Z21.13b-1994. Equipment and systems must comply with CMC, California State Energy Commission Regulations and, where applicable, must be American Refrigeration Institute (ARI), CSA International, Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown.

99-15555B Materials

99-15555B(1) Manufactured Units

Boiler:

Boiler must be a packaged unit, condensing high efficiency boiler, ASME inspected and stamped, UL or FM rated, CSA certified for LPG fuel. The unit must be a forced draft, intermittent ignition, modulating high-low firing, hot water boiler with 94 percent minimum AFUE. The heat exchanger and combustion chamber must be stainless steel. The boiler must be a sealed combustion system, taking only outside air for combustion, direct vent and exhausting the flue gas through the wall as shown in the plans. The boiler shall have integrated digital controller device with temperature and spark igniter.

Boiler must be equipped with a 30 psi ASME rated pressure relief valve. The boiler operating controls must allow for interruption of the firing circuit without affecting the safety controls.

The entire unit must be finished with a rust, corrosion and heat resistant industrial type enamel paint.

The boiler capacity must be as shown.

99-15555B(2) Accessories

Controls:

The boiler units must include the following controls:

1. Operating low water shut-off
2. Low water safety fuel shut-off with manual reset
3. ASME rated relief valve
4. Adjustable operating control
5. High limit safety control with manual reset
6. Pressure gauge and temperature indicator
7. Flame safety control
8. Safety pilot control
9. Flue gas thermometer
10. Air eliminator
11. Condensation connection and trap
12. Gas pressure regulator and shut-off valve
13. Low pressure and high pressure gas shut-off
14. Pilot gas pressure regulator and shut-off valve
12. Modulating boiler controller
13. Burner fan
14. Concentric vent termination kit

Expansion Tank: Expansion tank must be 14-gallon minimum capacity and of welded construction and must be ASME inspected and stamped for 125 psi working pressure. The tank must be equipped with a drain valve, air charging valve, high level alarm, low level alarm and gauge glass.

Sight Gage: Site gage must be ½ inch in size and of adequate length to indicate the entire contents of the tank. Gage must be an automatic type with drain cock and must be valved top and bottom to allow changing the glass without draining of the tank.

99-15555C Construction

99-15555C(1) Installation

Boiler:

The boiler must be installed under the manufacturer's instructions.

The boiler must be installed to provide the minimum access clearances recommended by the manufacturer for servicing and cleaning.

99-15555C(2) Field Quality Control

Pre-test Requirements:

Before starting or operating the boiler, equipment must be cleaned and checked for proper installation.

All operating controls and safety controls must be independently checked for proper installation and operation.

Acceptance Testing:

Prior to completion of boiler installation, and before permitting use of the boiler, the Contractor must fire the boiler and demonstrate all boiler operating and safety controls in the presence of the Engineer.

The Contractor must notify the Engineer and the inspection department of governing agencies in advance of the dates and times tests are to be performed.

Upon completion of mechanical work and pre-test requirements, or at such time prior to contract acceptance as determined by the Engineer, the Contractor must operate and test installed boiler system for at least 5 consecutive 24-hour days to demonstrate satisfactory overall operation.

Contractor must analyze the boiler combustion by-products using a single probe by inserting into the flue stack and must be complete with a pump for continuously sampling combustion by-products and provide a print out the following information.

1. Oxygen (percent)
2. Excess air (percent)
3. Carbon monoxide (parts per million)
4. Combustion efficiency (percent)
5. Stack loss (percent)
6. Carbon dioxide (percent)
7. Flue stack temperatures (°F)
8. Oxides of Nitrogen (parts per million)
9. Sulfur Dioxide (parts per million)

99-15555C(3) Instruction and Maintenance

Instruction:

The Contractor must instruct State personnel in the proper use, operations and daily maintenance of the boiler.

Emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies, must be reviewed.

State personnel must be trained in normal procedures to be followed in checking sources of operation failures or malfunctions.

Immediately prior to substantial completion, the Contractor must conduct a final inspection with State personnel present to determine that control systems and operating devices are operating properly.

Maintenance: The Contractor must provide continuing maintenance and inspection of the boiler for a period of one year following completion of the contract.

99-15555D 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 86-1.02 and the CA Code of Regs, Title 24, 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. The Contractor must make necessary repairs, replacements, adjustments and retests at his expense.

Final inspection for the completed electrical system will take place after all the various systems have been tested.

The Engineer must be notified 15 days in advance of testing and State personnel training on the job site.

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.

Related Work:

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations must be protected to comply with section 99-07270.

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.

99-16050B Materials

99-16050B(1) Conduits and Fittings

Rigid Steel Conduit and Fittings: Rigid steel conduit and fittings must be Type 1 complying with section 86-2.05A.

PVC Coated Rigid Steel Conduit and Fittings: PVC coated rigid steel conduit and fittings must be Type 2 complying with section 86-2.05A.

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 86-2.05A.

Liquidtight Flexible Metallic Conduit and Fittings: Liquidtight flexible metallic conduit and fittings must be Type 4 complying with section 86-2.05A.

99-16050B(2) Cables and Conductors

Data Cable and Telephone Cable:

Not Used

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 86-2.06.

Traffic rated pull boxes must comply with section 86-2.06A.

Electrical pull box covers and traffic rated pull box covers must be marked "ELECTRICAL."

99-16050B(4) Receptacles and Switches

Ground Fault Circuit Interrupter Receptacle, (GFCI): GFCI receptacle must be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt, specification grade, duplex receptacle suitable for wiring with stranded conductors. Receptacle must detect and trip at current leakage of 5 mA and must have front mounted test and reset buttons.

Duplex Receptacle: Duplex receptacle must be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, ivory color, specification grade duplex receptacle suitable for wiring with stranded conductors.

Portable Pressure Washer Receptacle: Portable Pressure Washer receptacle must be NEMA Type L14-30R, 3-P 4-W, 30-ampere, 120/240-volt, twist-lock, single, specification grade receptacle suitable for wiring with stranded conductors.

Brine Generating Control Panel Receptacle: Brine Generating Control Panel receptacle must be NEMA Type L14-30R, 30-ampere, 240-volt, twist-lock, single, specification grade receptacle suitable for wiring with stranded conductors.

Single Pole Switch: Single pole switch must be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch must be suitable for wiring with stranded conductors.

Timer Switch: Timer switch must be a spring wound mechanical timer with a rotary dial. Contacts must be rated 20 amperes at 120 volts. Time adjustments must range from zero to two hours.

99-16050B(5) Vehicle Sensor Switch

Vehicle Detection Sensor Switch:

Vehicle Detection Sensor Switch must be below-grade mounted, magnetoresistive-based sensor with two single-pole single-throw outputs, programmable on sensitivity, and must have non-volatile memory for storing settings. The sensor switch housing must be NEMA 6P rated, rugged ABS/polycarbonate housing suitable for below-grade installation. The sensor switch must operate on 24 volts DC and the switch must be reliably to detect the presence or absence of a vehicle and trigger an undercarriage wash. The sensor switch must be supplied with power supply interface unit and sensor cable and must be from the same manufacturer.

99-16050B(6) Miscellaneous Materials

Power Supply Interface Unit (For Undercarriage wash system): The power supply interface unit must be DIN rail mounted, and must have isolated 120-volt AC/ 24-volt DC transformer, a SETUP button and cutout switch, and intergal single-pole double-throw relay. Relay must have a contact rating of 20 amperes at 120 volts. The interface unit must have LED indicator lights for power status and output activites. The interface unit must be mounted inside a NEMA 4X junction box and location as shown.

Sensor cable: The sensor cable must be shielded 5-conductor cable with polyvinylchloride insulation jacket.

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.

Watertight Conduit Plug: Watertight conduit plug must be a hollow or solid stem expansion plug complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material must be non-stick type rubber resistant to oils, salt, and alkaline substances.

Anchorage Devices: Anchorage devices must be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, or expansion anchors as required by the supporting device.

Electrical Supporting Devices:

Electrical supporting devices must be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable iron.

Construction channel must be 1-5/8 inches x 1-5/8 inches, 12-gage galvanized steel channel with 17/32-inch diameter bolt holes, 1-1/2 inches on center in the base of the channel.

Ground Rod: Ground rod 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 86-2.05C 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 lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.
   c. Liquidtight flexible metallic conduit must be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet or exterior locations.

d. PVC coated rigid steel conduit must be used where shown, and base elbows and vertical risers through concrete slabs.
e. 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. Conduits must not be placed closer than 12 inches from a parallel hot water or steam pipe or 3 inches from such lines crossing perpendicular to the runs.
7. All raceway systems must be secured to the building structures using specified fasteners, clamps and hangers.
8. 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.
9. 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.
10. 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.
11. Raceways of different types must be joined using authorized couplings or transition fittings.
12. Expansion couplings must be installed where conduit crosses a building separation or expansion joint.
13. All floor and wall penetrations must be sealed watertight.

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 conduits must be securely fastened to PVC boxes and lighting fixtures using connectors.

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 86-2.09Cand section 86-2.09E.

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
120/240 volt-Three phase	Black, orange, blue
277/480 volt-Three phase	Brown, purple, yellow

Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code 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 or 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.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction must be mounted on 16-gage metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels must be supported directly from the structures above.

Multiple switches must be installed in standard boxes.

Pull Box Installation:

Pull box installation must comply with section 86-2.06C 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.

Anchorages:

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.

Mounting heights: Electrical system components must be mounted at the following mounting heights, unless otherwise shown. The mounting height dimensions must be measured above the finished floor to the bottom of the device or component.

Thermostats	3’-6”
Wall switches	3’-4”
Convenience outlets	3’-6”

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, starters, disconnect switches, transformers, 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.

Manufacturer's descriptive data must be submitted for the following:

Panelboard W
Panelboard SS

99-16432A(4) Quality Control and Assurance

Not Used

99-16432B Materials

99-16432B(1) Panelboards

Panelboard W: Panelboard W must be indoor type, bottom feed, surface-mounted, factory assembled, 3-phase, 4-wire, 240/120-volt, AC panelboard at least 20 inches wide with main circuit breaker as shown, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company, Westinghouse, General Electric, or equal.

Panelboard SS: Panelboard SS must be indoor type, bottom feed, surface-mounted, factory assembled, Single-phase, 3-wire, 240/120-volt, AC panelboard at least 20 inches wide with 100-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panels must be Square D Company, Westinghouse, General Electric, or equal.

Exhaust Fan Motor Starter: Exhaust fan motor starter must be 3-pole, 240-volt, NEMA Size 0 motor starter with toggle type operator in a NEMA-1 enclosure complete with thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Treated Water Pump Disconnect Switch: Treated Water Pump Disconnect switch must be 2-pole, 240-volt, AC, 30-ampere, fused, heavy duty safety switch in a NEMA-3R enclosure. The fuses must be sized to suit the unit furnished.

Door Operator Disconnect Switch: Door operator disconnect switch must be 3-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Exhaust Fan Disconnect Switch: Exhaust fan disconnect switch must be 3-pole, 240-volt, 60-ampere, specification grade, AC switch in a cast metal box with standard galvanized cover.

99-16432B(4) Transformer

Transformer: Transformer must be outdoor, dry type, floor mounted, 3-phase, 480-volt primary, 240/120-volt secondary, 75-KVA transformer with weather shielded enclosure. Transformer must have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage.

99-16432B(5) Miscellaneous Materials

High Water Alarm Panel: Provide high water alarm panel consisting of:

1. Control relay
2. Pilot lights

3. Terminal blocks

Install high water alarm equipment in a surface mounted NEMA Type 12 enclosure with hinged door. Install pilot lights, and nameplates on the exterior hinged door.

Control Relay, CR. CR must be 120-volt, AC, general purpose relay with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay must be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay must be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals.

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.

Plywood Backing Board: Plywood backing board for mounting electrical equipment must be ¾-inch, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

99-16432C Construction

Plywood Backing Board:

Plywood backing board must be securely fastened to walls or other vertical framing.

Surface to be coated must be cleaned of all dirt, excess materials, and filler by hand cleaning.

Exposed surfaces of plywood backing board must be coated to comply with "Wood, Painted" in section 99-09900. The color must match surrounding surfaces, or must be authorized by the Engineer.

Coatings must be applied to comply with the manufacturer's instructions. Each coat must be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

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 "Future” or “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.

Transformer Installation: Connect primary to minimum value taps during construction period and prior to initial building start-up. Make voltage readings and adjust tap connections to nominal voltage during final construction review and prior to building occupancy. Install conduit connections that will prevent transmission of the transformer vibrations to the conduit system. Transformers must be bolted to floor when floor mounted and bolted to wall with support brackets when wall mounted. Pad mounted transformers (unit substation) must be installed 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
Panelboard W	3/8	PANEL W
	3/8	240/120V, 3-Phase,4-Wire
Panelboard SS	3/8	PANEL SS
	3/8	240/120V, Single-Phase,3-Wire
Settling Tank Control Panel	3/8	Settling Tank Control Panel
Sump Pump Control Panel	3/8	Sump Pump Control Panel
High Water Alarm Panel	3/8	High Water Alarm Panel
Hydronic Heating Control Panel	3/8	Hydronic Heating Control Panel
Hydrocarbon Control Unit	3/8	Hydrocarbon Control Unit
UV Disinfection Unit	3/8	UV Disinfection Unit
Sludge Sensor	3/8	Sludge Monitoring System
Oil Sensor	3/8	Oil Monitoring System
Brine Truck Filler	3/8	Brine Truck Filler

99-16432D Payment

Not Used

99-16500 LIGHTING

99-16500A General

99-16500A(1) Summary

Scope: This work consists of furnishing, installing and connecting all lighting equipment.

99-16500A(2) Definitions

Not Used

99-16500A(3) Submittals

Submit manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions. Submit wiring diagram and component layout.

Closeout Document Submittals:

Include in each closeout document:

1. Parts list
2. Operating instructions
3. Maintenance instructions
4. Wiring schematics

Submit three copies of each closeout document in the following manner:

1. One CD with PDF files
2. Two individual 3-ring binders containing paper copies

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

99-16500B Materials

99-16500B(1) General

Lighting Fixture Lamps: Lighting fixture lamps must be type and size as shown.Lighting Fixtures: Lighting fixtures must be as shown. Outdoor luminaires must be listed and labeled "Fixture Suitable For Wet Locations."

L1: Heavy duty, IP66, surface mounted fixture with one, 73-watt LED unit, highly diffuse acrylic lens, full cutoff shield, wide and spread distribution, 360 degree motion sensor embedded and suitable for high bay and wet locations with high power factor and 100,000 hours expected life, The fixture must have extruded aluminum heat sink to reduce LED and driver temperature. Operational ambient temperature for the fixture must be -13 to 131 degree F. The fixture must be Lithonia, PTN series, Holophane, HLN series, or equal.

L2: Wall mounted LED exterior, 74-watt LED unit, wet location fully sealed, high efficacy LEDs with aluminum heat sink, class 1 electronic driver with high power factor and 100,000 hours expected life, surge protection, die cast aluminum housing, tempered glass lens, 120 V(AC) operation, integrated photocell and dark bronze power coat finish. The fixture must be Lithonia, ASW1-LED series, Forefront, FRFTWP series, or equal.

L3: 54" LED fixture, 59-watt LED unit, integrated motion sensor, 4495 minimum delivered lumens at 5700 degree kelvin and with CRI of at least 80 and designed lifetime for 60,000 hours. The fixture housing must be constructed from one piece injected molded, impact resistance, frosted polycarbonate and 20 gauge steel channel complete with a clear transparent, polycarbonate lens with aesthetic rib details and asymmetric optical control film. LED engine driver must be UL listed, 50,000 hour design life. Fixture mounting adapters and trims must be suitable for surface mounting and wet location listed. The fixture must be Lithonia, VAP LED series, Holophane, EVT4 LED series, or equal.

99-16500C Construction

Lighting Fixtures:

Lighting fixtures must be mounted securely to comply with the manufacturer's instructions. Mounting methods must be suitable for the particular type of ceiling or support at each location.

The Contractor must provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures must be set at the mounting heights shown, except heights shown must be adjusted to meet conditions.

99-16500D Payment

Not Used

99-16911 HYDRONIC HEATING CONTROL PANEL

99-16911A General

99-16911A(1) Summary

Scope: This work consists of furnishing and installing hydronic heating control panel.

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

Hydronic Heating Control Panel:

Hydronic heating control panel enclosure must be single exterior hinged door, dust tight NEMA Type 3R enclosurecontaining 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. All interior control wires must be 19 strand No. 14 MTW. Wires must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. 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.

Hydronic Heating Main Breaker, MB: Hydronic heating main breaker must be 2-pole, 240-volt, AC, molded case circuit breaker with 100-ampere frame, 40-ampere trip, and interrupting capacity of 10,000 amperes (symmetrical) at 240 volts.

Hydronic Heating Control Breaker, CB1: Hydronic heating control breaker must be single-pole, 120-volt, AC, molded case circuit breaker with 100-ampere frame, ampere trip as shown, and interrupting capacity of 10,000 amperes (symmetrical) at 120 volts.

Circulating Pumps Breaker, CB1A, CB1B, CB2 thru CB4: Circulating pumps breaker must be single-pole, thermal-magnetic type, 120-volt, AC, molded case circuit breaker with 100-ampere frame, ampere trip as shown, and interrupting capacity of 10,000 amperes (symmetrical) at 120 volts.

Starters, ST1A, ST1B, ST2 thru ST4: Starter must be NEMA Size 1, NEMA rated, 2-pole, 240-volt, contactor with 120-volt coil, and non-adjustable overload relay. Overload relay must be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relay must have one thermal overload elements and must trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starter must be NEMA rated.

Control Transformer, CT: Control transformer must be double-wound, dry-type 0.75 KVA, 60 Hz, transformer with 120-volt primary and 24-volt secondary.

Control Transformer Overload. Control transformer overload must be a DIN rail mounted fuse holder rated minimum of 240-V (ac), single pole, with integrated blown-fuse indicator light and fuse size (in amperes) as shown. Provide ten spare fuses with same size (in amperes) as shown.

Time Delay Relay, TDR1: Time Delay Relay must be solenoid-operated, pneumatically-timed delay relay with 120-volt, AC, coil, sealed gas chamber, and double-pole, double-throw, double-break contacts having a capacity of 10 amperes at 120 volts, AC. TDR1 must have time delay on deenergizing adjustable from 1.5 to 15 minutes initially set at 7 minutes.

Control Relay, CR1: Control relay must be 120-volt, AC, general purpose relay with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay must be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay must be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals.Control Relay, CR2. CR2 must be similar to Control relay, CR1, except 24-volt, AC, solenoid open type and continuous duty rated relay.

Ground and Neutral Bars: Ground and Neutral bars must be 100-ampere copper neutral bar with circuit taps.

Terminal Block, TB: Terminal block must be 60-ampere, 120/240-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.

Selector Switches, SS1, SS1A, SS1B, SS2 thru SS4: Selector switch must be rotary action, single-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch must have legend ring plate marked HAND-OFF-AUTO. SS5: SS5 must be Three-way switch, 20-ampere, 120/277-volt, heavy duty type, commercial grade, ivory color switch with silver alloy contacts. Switch must be suitable for wiring with stranded conductors.

Pilot Lights, PL1, PL2, PL1A, PL1B, PL1AB, PL2 thru PL5: Pilot lights must be 1.2 inch diameter, NEMA Type 4, push-to-test type, panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with colored plastic lens, and screw cap. The color of the lens must be as shown.

Flow Switch 1 (FS1). Flow switch must be a fluid flow switch activated by fluid flow in the 2-inch pipe. The unit must operate independently of pressure and respond to flow only and must consist of a threaded brass mounting base, stainless steel actuator and a 10-ampere, 120-volt, AC, single pole double throw switch enclosed in a watertight housing. Flow switch must be rated for 125 psi.

Temperature Process Controller No.1, TPC1. Temperature process controller must be one temperature input, four relay output stages, microprocessor based controller and sensor system. The controller must have integral with the controller a liquid crystal display for interactive prompting during programming and display of assigned setpoints, differential values, and to view system status and operating information. The controller must be suitable to operate on 120-volt, AC, and output relays must be rated at 10-ampere at 120-volt. The controller must be able to be programmed for both heating and cooling mode and must have accuracy of +/- ½ degree or better ºF, at –30 ºF to 125 ºF operating temperature. Setpoint temperature range of temperature process controller must be from –40 ºF to 220 ºF. An appropriate outdoor air temperature monitoring type, weatherproof sensor elements complete with pigtails, sensor cables, sensor enclosure must be supplied as part of a complete package.

Temperature Process Controller No. 3, TPC3. Temperature Process Controller No. 3 for snow detection and melting must be a single zone, microprocessor based controller and sensor system specifically designed for automatic snow/ice and moisture detection and melting. The controller must have integral with the controller a liquid crystal display for interactive prompting during programming and display of assigned set point, differential values, and to view system status and operating information. The controller must be suitable to operate on 120-volt, AC, and output relays must be rated at 5-ampere at 230-volt. The controller must be the pulse width modulation type controller and have the following features:

Manual override
Temporary Idle
Adjustable warm weather shut down
Remote display and adjustment capabilities
Test sequence to ensure proper component operation
Pump and valve exercising

An appropriate snow/ice and moisture detection sensors complete with single length multi-conductor cable and die cast brass housing designed to be installed in the concrete walkway must be supplied as part of a complete package. Outdoor air temperature monitoring type, weatherproof sensor elements complete with pigtails, sensor cables, sensor enclosure must be supplied also as part of a complete package.

Temperature Process Controller No. 2 and 4, (TPC2 and TPC4). Temperature process controller for slab/floor heating must be two temperature input (outdoor air temperature and indoor floor temperature), one relay for one stage heating output, microprocessor based thermostat and sensor system. The thermostat must have a liquid crystal display integral with the unit for interactive prompting during programming and display of assigned setpoints, set-up values, and to view system status and operating information. The thermostat must be suitable to operate on 24-volt, AC, and output relays must be rated at 2-amperes at 24-volt, AC. The thermostat must be able to be programmed for heating mode and must have accuracy of +/- ½ degree or better ºF, at 32 ºF to 122 ºF ambient operating temperature. Setpoint temperature range of thermostat must be from 40 ºF to 122 ºF. Thermostat and sensor system must be specifically designed for automatic outdoor air/slab sensing, and heating. Thermostat must be the pulse width modulation type and have a two-way communication feature with other thermostats. An appropriate outdoor air temperature and slab temperature monitoring type, weatherproof sensor elements complete with pigtails, sensor cables, sensor enclosure must be supplied as part of a complete package.

Pump Alternator. Pump alternator must be microprocessor based (proportional, integral, derivative) PID pump sequencer specifically designed to provide pump control in stand-by mode. In stand-by mode, pump alternator must automatically switches over from lead pump to stand-by pump during pump failure. The pump alternator must be suitable to operate on 120-volt, AC. Unit must have pump relays that are rated at 10-amperes at 240-volt AC and alarm relays rated at 2-amperes at 240-volt AC. The pump alternator must have indicating lights, rotating dials, and DIP switches integral with the unit for interactive prompting during programming, display of alarms, set-up values, to view system status and operating information. The pump alternator must have the following features:

Adjustable flow proof delay
Exercising
Equal run time rotation
Alarm per pump or Alarm levels
Test sequence to ensure proper component operation

99-16911B(2) Fabrication

Component Mounting:

The following electrical components must be mounted on the back panel of the Hydronic Control Panel enclosure:

Terminal Block, TB

Neutral Block, N
Ground Block, G
Main Breaker, MB
Control Breaker, CB1
Circulating Pumps Breakers, CB1A, CB1B, CB2 thru CB4
Starters, ST1A, ST1B, ST2 thru ST4
Control Transformer
Control Transformer Overload
Time Delay Relay, TDR1
Control Relays, CR1 thru CR2
Pump Alternator
Temperature Process Controllers, TPC1, TPC2 thru TPC4
Nameplates

The following electrical components must be mounted on the hinged door of the Hydronic Control Panel enclosure:

Selector Switches, SS1, SS1A, SS1B, SS2 thru SS5
Pilot Lights, PL1, PL2, PL1A, PL1B, PL1AB, PL4 thru 7
Starters' Overload Reset Pushbutton
Nameplates

99-16911C Construction

99-16911C(1) Installation

The hydronic heating control panel must be installed 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. Wires must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. 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. No equipment or device must be mounted on the side or at the bottom of the panel. A minimum of 6 inches of empty space must be provided at the bottom of the panel for bundling field conductors and terminating field conduits.

Use of dark gray control conductors for the wiring of control must be prohibited.

Conduction type thermosensors installations must be done as per the direction of the engineer.

99-16911C(2) Operation

Hydronic Heating System. The automatic operation of the hydronic heating system is controlled by the "Heat Enable- Temperature Process Controller No. 1 (TPC1)". For the heating system to operate automatically in winter, TPC1 must be set in heat mode and have a temperature input of 52 ºF (initial setting) and below from the Outdoor Temperature Sensor. The hydronic heating system control consists of the following:

Boiler
Boiler's Main Circulating Pumps Control
Snow/Ice Melt Control
Slab/floor Heating Control

Boiler. In the system, there is only one boiler and it is factory equipped with control equipment that will maintain the desired temperature of the water stored or flowing through it. Boiler will start and continue heating water while there is an enable signal coming from Temperature Process Controller No. 1 (TPC1) through Control Relay 1 (CR1).

Boiler's Main Circulating Pumps Control. There are two main circulating pumps (Pump 1A and Pump 1B) pumping water through the main line. One of the pump is always on standby in case the lead pump fails. The Pump Alternator must activate and continue running the lead pump when pump demand signal exist from TPC1 through Time Delay Relay 1 (TDR1). Once pump contact is turned on, there must be time delay (initially set at 10 seconds) for detecting a water flow signal from Flow Switch 1 (FS1). If a flow signal is not present within the selected time, the control turns off the lead pump contact and turns on the lag pump contact then an alarm contact is activated to indicate failure. There must be no time that both pumps run together at the same time. Pump alternator must automatically changes the operating sequence of the pumps to allow equal usage of both pumps. During summer, if a pump has not been operated at least once every three days, the control turns on the output for 10 seconds to minimize the possibility of a pump seizing during inactivity.

Snow/Ice Melt Control. When the Temperature Process Controller No. 3,(TPC3) detects low (field adjustable) outdoor air and slab temperature, together with the presence of moisture on the slab, then TPC3 will turn “ON” Snow Melt Circulating Pump. This circulating pump will continue to run as long as the slab and outdoor air temperature is low and moisture is present on the slab.

Slab Heating Control. When the Temperature Process Controller No. 2 and 4, (TPC2 and TPC4) detect low (field adjustable) slab and outdoor air temperature, then TPC will turn “ON” slab circulating pump . This circulating pump will continue to run as long as the slab and outdoor air temperature is below the setpoint temperature.

99-16911C(3) Field Testing

After complete installation work in the field of all various systems, the Hydronic heating system must be tested in the presence of the Engineer to demonstrate that all functions operate properly. The contractor must provide all materials and equipment require for testing the system. The contractor must be responsible for the necessary repairs, replacements, adjustments and retests at his own expense.

99-16911C(4) Training

After complete installation work, training shall be provided for State personnel in operation, troubleshooting, and maintenance of the Hydronic heating system. The training period must be minimum of 4 hours and shall be conducted for not more than 6 State personnel. The trainer for the control system must be authorized representative of the panel fabricator or integrator, and must have complete knowledge of all devices installed inside the control panel and its peripherals including but not limited to temperature process controllers, temperature sensors, boiler controller, alarm lights, indicating lights, and pump motors.

99-16912 SETTLING TANK PUMP CONTROL PANEL

99-16912A General

99-16912A(1) Summary

Scope: This work consists of furnishing and installing settling tank pump control equipment.

Related Work: Thermal and moisture protection for submersible pump motor must comply with section 99-15.

99-16912A(2) Definitions

Not Used

99-16912A(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.

99-16912A(4) Quality Control and Assurance

Not Used

99-16912B Materials

99-16912B(1) General

Settling Tank Pump Control Panel, SPC:

Settling tank pump control panel, SPC, must be single exterior hinged door enclosure containing a fixed interior electrical mounting panel and hinged interior deadfront panel. The enclosure must be made of 0.075-inch (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. Control panel must be provided with floor stands as shown.

A metal barrier must be provided as shown. Metal barrier for the intrinsically safe relays must be full depth barrier between the interior panel and the interior hinged door. A 1½-inch insulated chase nipple with lock-nut and nylon bushing must be provided for conductor entry.

The enclosure must be factory pre-wired to comply with NEMA Class IIC wiring. All wires entering or leaving the enclosure must terminate on terminal blocks. Control wiring must be 7 strand No. 14 MTW except for hinge wiring, which must be 19 strand No. 14 MTW. Panel must be wired using red colored insulation conductors for general wiring and white colored insulation conductors for neutrals. Use of gray colored insulation conductors for wiring is prohibited. Wires must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. Wiring must be arranged so that any piece of apparatus may be removed without disconnecting any wiring except the leads to that piece of apparatus. No equipment or device must be mounted on the side or at the bottom of the panel. A minimum of 150 millimeters of empty space must be provided at the bottom of the panel for bundling field conductors and terminating field conduits.

A schematic 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, PMB: Pump main breaker, PMB, must be 2-pole, 240-volt, AC, molded case circuit breaker with 100-ampere frame, 30-ampere trip, and interrupting capacity of 10K amperes (symmetrical) at 240 volts. Power distribution blocks must be installed on load side of the circuit breaker.

Starter, ST1 and ST2: Starters, ST1 and ST2, must be NEMA Size 00, NEMA rated, 2-pole, 240-volt, contactors with 120-volt coil, and non-adjustable overload relays. Overload relays must be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relays must have one thermal overload elements and must trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starters must have one normally-open auxiliary contact and one normally-closed auxiliary contact.

Pump Disconnects, PD1 and PD2: Pump disconnects, PD1 and PD2, must be 2-pole, 240-volt, AC, 100-ampere frame, 15-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be 10K amperes (symmetrical) at 240 volts.

Control Disconnect, CD: Control disconnect, CD, must be single pole, 120/240-volt, AC, 100-ampere frame, 15-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be 10,000 amperes (symmetrical) at 120 volts.

Control Relays, CR1 through CR6: Control relays, CR1 through CR6, must be 120-volt, AC, general purpose relays with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts with pilot light. Relays must be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relays must be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals.

Time Meters, TM1 and TM2: Time meters, TM1 and TM2, must be 240-volt, 60 Hz running time meters with 0 to 99,999.9 hours range without a reset.

Seal Failure Relays, SFR1 and SFR2: Seal failure relays, SFR1 and SFR2, must be 120-volt, 60 Hz, transformer and relay combinations. Seal failure relays must be as shown or as recommended by the pump manufacturer. The seal failure relays, complete with pump leak detector light, sensor probe continuity test pushbutton and test indicator light, must be a factory assembled unit mounted inside the control panel as shown in a NEMA Type 1 enclosure. Relays must include one normally open and one normally closed contact having a rating of 10 amperes at 120 volts AC.

Terminal Block, TB: Terminal block, TB, must be 20-ampere, 600-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. The identifying numbers of the terminating wires as shown on the shop drawings must be engraved in the marking strip. Terminal blocks must have tubular, high-pressure clamp connectors.

Ground and Neutral Bars: Ground and neutral bars must be 100-ampere copper neutral bars with circuit tabs.

Alarm Reset, AR: Alarm reset, AR, must be 1 1/8-inch heavy duty oil-tight DPSTpushbutton with normally-closed contacts. The contact must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Alarm Test Switch, AT: Alarm test switch, AT, must be the same as AR, except that the contact must be normally open.

Selector Switches, SS1 and SS2: Selector switches, SS1 and SS2, must be rotary action single-pole, 3-position, 10-ampere, 120 -volt switches. Switch contacts must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break), and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switches must have legend plate marked “HAND-OFF-AUTO.”

Pilot Lights, PL1 through PL7: Pilot lights, PL1 through PL7, must be 30 mm panel mounted pilot lights with lens and screw cap and a high intensity LED, 120-volt lamp. Color of pilot lights must be as shown.

Intrinsically Safe Relays, ISR1, ISR2 and ISR3: Intrinsically safe relays, ISR1, ISR2 and ISR3, must be latching type and completely self-contained, solid-state relays approved for use with sensors in Class 1, Division 1 locations. Relays must be suitable for supply voltage of 120 volts, AC, with 0.3 ampere, 120-volt rated, single-pole, double throw contact. Relays must have maximum turn-on time of five milliseconds and maximum output current of 100 microamperes at 28 volts, AC.

Float Switches, FS1 through FS3: Float switches, FS1 through FS3, must be 120-volt, 10-ampere, single-pole, double-throw, mechanical tilt float, non-mercury switch. Switch enclosures must be leak proof, shockproof and corrosion resistant and UL listed for use in sewage. Switches must be provided with sufficient length of cable to run from the switch to the Settling tank pump control panel without splices. Switches must operate at approximately 90 degrees of tilt. The switches must come with all mounting hardware, weights, and assorted equipment necessary to be installed at the elevations shown and as recommended by the manufacturer. Switches must be suitable for use with intrinsically safe circuits. FS3 must be normally closed and FS1, and FS2 must be normally open type switches.

Alternator Timer Switch, ALT: Alternator timer switch, ALT, must be 120-volt, 60 Hz, synchronous motor driven, mechanical memory, 60-minute recycling timer with single-pole, double-throw, snap action, 15-ampere, 120-volt contacts. Contact positions must alternate at 30-minute intervals.

Timer Switch, TS: Timer switch, TS, must be 120-volt, 60 Hz, assymmetrical repeat cycle unit, DIN rail mounting, multi-programmable dual digital display timer, time range from 1 second to 24 hours, LED indicators for ON-time and OFF-time, single-pole, double-throw, snap action, 120-volt contacts.

Time Delay Relay, TDR: Time delay relay, TDR, must be solid-state adjustable, plug-in time delay relay with 120-volt, AC, coil, and 2 single-pole, double-throw contacts rated 10 amperes at 120 volts, AC. TDR must have a time delay on energizing, adjustable from one to 300 seconds, initially set at 120 seconds. Socket for relay must be barrier type, 8-pin tube type relay socket, with 10-ampere contacts and screw terminals.

Alarm Light, AL: Alarm light, AL, must be cast-metal, vapor-tight lighting fixture for use with threaded rigid conduit. Light fixture must have a clear polycarbonate globe. Lamp must be 8-watt, Red LEDs, 120-volt medium base LED lamp, rated MTBF of 100,00 hours.

99-16912B(2) Fabrication

Component Mounting:

The following electrical components must be mounted on the fixed interior electrical mounting panel of the Settling Tank Pump Control Panel: pump main breaker, PMB; Starters, ST1 and ST2; Control disconnect, CD; Receptacle disconnect, RD; Control transformer, CT; Pump disconnects, PD1 and PD2; Control relays, CR1 through CR7; Seal failure relays, SFR1 and SFR2; Alternator Timer switch, ALT; Timer switch, TS; Intrinsically safe relays, ISR1 through ISR3; Ground and neutral bars; and Terminal blocks. Spacers must be installed with all breakers (PMB, PD1, PD2, and CD) so that they are externally operable with the hinged door closed. The hinged door must only be open when PMB is in the “OFF” position.

The following electrical components must be mounted on the hinged interior deadfront panel of the Settling Tank Pump Control Panel: Time meters, TM1 and TM2; Alarm reset, AR; Alarm test switch, AT; Selector switches, SS1 and SS2; Pilot lights, PL1 through PL7; Overload reset pushbuttons, OL1 and OL2.

The following equipment must be mounted on the side of the Settling Tank Pump Control Panel: Alarm light, AL as shown.

99-16912C Construction

99-16912C(1) Installation

The Settling tank pump control panel must be installed on as shown.

All bolts and fasteners in the sump must be stainless steel.

All concrete around conduit penetrations must be finished smooth and sloped in a way to avoid standing water around the conduit.

99-16912C(2) Operation

Automatic Operation:

The automatic operation of the sewage lift pumps must be controlled by float switches as shown. When the liquid level rises to FS2 elevation Timer switch, TS must be energized, which must start one of the pumps through relay CR5 and alternator time switch, ALT. The pump must operate on repeat cycle timer with ON-time and OFF-time operation until the liquid level lowers to FS3 elevation, and relay CR2 is de-energized.

The high liquid level alarm circuit must be actuated when the liquid level rises to FS1 elevation, and relay CR5 must be energized. When relay CR5 is energized, it energize time delay relay, TDR. Time delay relay TDR must energize alarm light, AL, after a period of two minutes if the liquid level does not go down.

The low-level alarm circuit must be activated by float switch FS1 when the liquid level drops to FS1 elevation, and relay CR2 must be energized. Relay CR2 must open contacts to stop the pump motor and must also energize alarm light, AL. The alarm light, AL, must stay energized until the alarm-reset pushbutton is pushed.

Each submersible pump motor must have thermal and moisture protection. The thermal protection must contain contacts that will open and stop the pump motor should the temperature in the motor rise above the design operating temperature.

Each moisture protection must consist of two electrode sensors, which will detect the presence of water in respective oil filled chamber. The electrodes must sense this water through seal failure relays, SFR1 and SFR2, located in the pump control panel. Relays SFR1 and SFR2 must energized alarm light, AL, seal failure indicator pilot lights, PL6 and PL7, and stop the pump motors through relays CR5, respectively, when moisture is in the oil filled chambers.

Alternator time switch, ALT, must alternate the pumps after a running time of 30 minutes.

99-16913 LIFT STATION CONTROL PANEL

99-16913A General

99-16913A(1) Summary

Scope: This work consists of furnishing and installing lift station pump control equipment.

Related Work: Thermal and moisture protection for submersible pump motor must comply with section 99-15.

99-16913A(2) Definitions

Not Used

99-16913A(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.

99-16913A(4) Quality Control and Assurance

Not Used

99-16913B Materials

99-16913B(1) General

Lift Pump Control Panel, LPC:

lift pump control panel, LPC, must be single exterior hinged door enclosure containing a fixed interior electrical mounting panel and hinged interior deadfront panel. The enclosure must be made of 0.075-inch (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. Control panel must be provided with floor stands as shown.

A metal barrier must be provided as shown. Metal barrier for the intrinsically safe relays must be full depth barrier between the interior panel and the interior hinged door. A 1½-inch insulated chase nipple with lock-nut and nylon bushing must be provided for conductor entry.

The enclosure must be factory pre-wired to comply with NEMA Class IIC wiring. All wires entering or leaving the enclosure must terminate on terminal blocks. Control wiring must be 7 strand No. 14 MTW except for hinge wiring, which must be 19 strand No. 14 MTW. Panel must be wired using red colored insulation conductors for general wiring and white colored insulation conductors for neutrals. Use of gray colored insulation conductors for wiring is prohibited. Wires must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. Wiring must be arranged so that any piece of apparatus may be removed without disconnecting any wiring except the leads to that piece of apparatus. No equipment or device must be mounted on the side or at the bottom of the panel. A minimum of 150 millimeters of empty space must be provided at the bottom of the panel for bundling field conductors and terminating field conduits.

A schematic 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, PD: Pump main breaker, PD, must be 1-pole, 120-volt, AC, molded case circuit breaker with 100-ampere frame, 20-ampere trip, and interrupting capacity of 10K amperes (symmetrical) at 120 volts. Power distribution blocks must be installed on load side of the circuit breaker.

Starter, ST1: Starters, ST1, must be NEMA Size 0, NEMA rated, 1-pole, 120-volt, contactors with 120-volt coil, and non-adjustable overload relays. Overload relays must be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relays must have one thermal overload elements and must trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starters must have one normally-open auxiliary contact and one normally-closed auxiliary contact.

Control Disconnect, CD: Control disconnect, CD, must be single pole, 120/240-volt, AC, 100-ampere frame, 15-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be 10,000 amperes (symmetrical) at 120 volts.

Control Relays, CR1 through CR2: Control relays, CR1 through CR2, must be 120-volt, AC, general purpose relays with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts with pilot light. Relays must be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relays must be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals.

Time Meter, TM: Time meter, TM, must be 120-volt, 60 Hz running time meters with 0 to 99,999.9 hours range without a reset.

Terminal Block, TB: Terminal block, TB, must be 20-ampere, 600-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. The identifying numbers of the terminating wires as shown on the shop drawings must be engraved in the marking strip. Terminal blocks must have tubular, high-pressure clamp connectors.

Ground and Neutral Bars: Ground and neutral bars must be 100-ampere copper neutral bars with circuit tabs.

Alarm Reset, AR: Alarm reset, AR, must be 1 1/8-inch heavy duty oil-tight pushbutton with one normally-closed contact. The contact must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Selector Switche, SS1: Selector switche, SS1, must be rotary action single-pole, 3- position, 10-ampere, 120 -volt switches. Switch contacts must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break), and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switches must have legend plate marked “HAND-OFF-AUTO.”

Pilot Lights, PL1 through PL3: Pilot lights, PL1 through PL3, must be 30 mm panel mounted pilot lights with lens and screw cap and a high intensity LED, 120-volt lamp. Color of pilot lights must be as shown.

Intrinsically Safe Relays, ISR1, and ISR2: Intrinsically safe relays, ISR1, and ISR2, must be latching type and completely self-contained, solid-state relays approved for use with sensors in Class 1, Division 1 locations. Relays must be suitable for supply voltage of 120 volts, AC, with 0.3 ampere, 120-volt rated, single-pole, double throw contact. Relays must have maximum turn-on time of five milliseconds and maximum output current of 100 microamperes at 28 volts, AC.

Float Switches, FS1 through FS3: Float switches, FS1 through FS3, must be 120-volt, 10-ampere, single-pole, double-throw, mechanical tilt float, non-mercury switch. Switch enclosures must be leak proof, shockproof and corrosion resistant and UL listed for use in sewage. Switches must be provided with sufficient length of cable to run from the switch to the Lift station pump control panel without splices. Switches must operate at approximately 90 degrees of tilt. The switches must come with all mounting hardware, weights, and assorted equipment necessary to be installed at the elevations shown and as recommended by the manufacturer. Switches must be suitable for use with intrinsically safe circuits. FS1 must be normally closed and FS2, FS3 and FS4 must be normally open type switches.

99-16913B(2) Fabrication

Component Mounting:

The following electrical components must be mounted on the fixed interior electrical mounting panel of the Lift Station Pump Control Panel: pump main breaker, PD; Starters, ST1; Control disconnect, Control relays, CR1 through CR2; Seal failure relays, SFR1 and SFR2; Intrinsically safe relays, ISR1 through ISR2; Ground and neutral bars; and Terminal blocks. Spacers must be installed with all breakers (MB, PD, and CD) so that they are externally operable with the hinged door closed. The hinged door must only be open when PD is in the “OFF” position.

The following electrical components must be mounted on the hinged interior deadfront panel of the Lift Station Pump Control Panel: Time meter, TM; Alarm reset, AR; ; Selector switche, SS1; Pilot lights, PL1 through PL3; Overload reset pushbutton, OL.

The following equipment must be mounted on the side of the Lift Station Pump Control Panel: Alarm light, AL as shown.

99-16913C Construction

99-16913C(1) Installation

The Lift station pump control panel must be installed on as shown.

All bolts and fasteners in the sump must be stainless steel.

All concrete around conduit penetrations must be finished smooth and sloped in a way to avoid standing water around the conduit.

99-16913C(2) Operation

Automatic Operation:

The automatic operation of the lift pumps must be controlled by float switches FS2, and FS3 as shown. When the liquid level rises to FS3 elevation, relay CR2 must be energized, which must start the pump. The pump must operate until the liquid level lowers to FS2 elevation, and relay CR2 is de-energized.

The high liquid level alarm circuit must be actuated when the liquid level rises to FS1 elevation, and relay CR1 must be energized. When relay CR1 is energized, it must energize alarm pilot light.

Submersible pump motor must have thermal and moisture protection. The thermal protection must contain contacts that will open and stop the pump motor should the temperature in the motor rise above the design operating temperature.

99-16913D Payment

Not Used

REVISED STANDARD SPECIFICATIONS APPLICABLE TO THE 2010 EDITION OF THE STANDARD SPECIFICATIONS

REVISED STANDARD SPECIFICATIONS DATED 07-19-13

ORGANIZATION

Revised standard specifications are under headings that correspond with the main-section headings of the *Standard Specifications*. A main-section heading is a heading shown in the table of contents of the *Standard Specifications*. A date under a main-section heading is the date of the latest revision to the section.

Each revision to the *Standard Specifications* begins with a revision clause that describes or introduces a revision to the *Standard Specifications*. For a revision clause that describes a revision, the date on the right above the clause is the publication date of the revision. For a revision clause that introduces a revision, the date on the right above a revised term, phrase, clause, paragraph, or section is the publication date of the revised term, phrase, clause, paragraph, or section. For a multiple-paragraph or multiple-section revision, the date on the right above a paragraph or section is the publication date of the paragraphs or sections that follow.

Any paragraph added or deleted by a revision clause does not change the paragraph numbering of the *Standard Specifications* for any other reference to a paragraph of the *Standard Specifications*.

^^^

Add to the 1st table in section 1-1.06:

04-19-13

LCS	Department's lane closure system
POC	pedestrian overcrossing
QSD	qualified SWPPP developer
QSP	qualified SWPPP practitioner
TRO	time-related overhead
WPC	water pollution control

06-20-12

Delete the abbreviation and its meaning for *UDBE* in the 1st table of section 1-1.06.

10-19-12

Delete "Contract completion date" and its definition in section 1-1.07B.

10-19-12

Delete "critical delay" and its definition in section 1-1.07B.

Replace "day" and its definition in section 1-1.07B with:

10-19-12

day: 24 consecutive hours running from midnight to midnight; calendar day.

1. **business day:** Day on the calendar except a Saturday and a holiday.
2. **working day:** Time measure unit for work progress. A working day is any 24-consecutive-hour period except:
   - 2.1. Saturday and holiday.
   - 2.2. Day during which you cannot perform work on the controlling activity for at least 50 percent of the scheduled work shift with at least 50 percent of the scheduled labor and equipment due to any of the following:
     - 2.2.1. Adverse weather-related conditions.
     - 2.2.2. Maintaining traffic under the Contract.
     - 2.2.3. Suspension of a controlling activity that you and the Engineer agree benefits both parties.
     - 2.2.4. Unanticipated event not caused by either party such as:
       - 2.2.4.1. Act of God.
       - 2.2.4.2. Act of a public enemy.
       - 2.2.4.3. Epidemic.
       - 2.2.4.4. Fire.
       - 2.2.4.5. Flood.
       - 2.2.4.6. Governor-declared state of emergency.
       - 2.2.4.7. Landslide.
       - 2.2.4.8. Quarantine restriction.
     - 2.2.5. Issue involving a third party, including:
       - 2.2.5.1. Industry or area-wide labor strike.
       - 2.2.5.2. Material shortage.
       - 2.2.5.3. Freight embargo.
       - 2.2.5.4. Jurisdictional requirement of a law enforcement agency.
       - 2.2.5.5. Workforce labor dispute of a utility or nonhighway facility owner resulting in a nonhighway facility rearrangement not described and not solely for the Contractor's convenience. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility.
   - 2.3. Day during a concurrent delay.
3. **original working days:**

3.1. Working days to complete the work shown on the *Notice to Bidders* for a non–cost plus time based bid.
3.2. Working days bid to complete the work for a cost plus time based bid.

Where working days is specified without the modifier "original" in the context of the number of working days to complete the work, interpret the number as the number of original working days as adjusted by any time adjustment.

Replace "Contract" in the definition of "early completion time" in section 1-1.07B with:

10-19-12

work

Replace "excusable delay" and its definition in section 1-1.07B with:

10-19-12

delay: Event that extends the completion of an activity.

1. **excusable delay:** Delay caused by the Department and not reasonably foreseeable when the work began such as:
   1.1. Change in the work
   1.2. Department action that is not part of the Contract
   1.3. Presence of an underground utility main not described in the Contract or in a location substantially different from that specified
   1.4. Described facility rearrangement not rearranged as described, by the utility owner by the date specified, unless the rearrangement is solely for the Contractor's convenience
   1.5. Department's failure to obtain timely access to the right-of-way
   1.6. Department's failure to review a submittal or provide notification in the time specified
2. **critical delay:** Excusable delay that extends the scheduled completion date
3. **concurrent delay:** Occurrence of at least 2 of the following events in the same period of time, either partially or entirely:
   3.1. Critical delay
   3.2. Delay to a controlling activity caused by you
   3.3. Non–working day

Replace "project" in the definition of "scheduled completion date" in section 1-1.07B with:

10-19-12

work

Add to section 1-1.07B:

10-19-12

Contract time: Number of original working days as adjusted by any time adjustment.

06-20-12

Disadvantaged Business Enterprise: Disadvantaged Business Enterprise as defined in 49 CFR 26.5.

Replace "PO BOX 911" in the District 3 mailing address in the table in section 1-1.08 with:

04-20-12

703 B ST

Add to the table in section 1-1.11:

01-20-12

Office Engineer–All Projects Currently Advertised	http://www.dot.ca.gov/hq/esc/oe/weekly_ads/all_advertised.php	--	--

^^

2 BIDDING

07-19-13

Replace the 3rd paragraph of section 2-1.06B with:

01-20-12

If an *Information Handout* or cross sections are available:

1. You may view them at the Contract Plans and Special Provisions link at the Office Engineer–All Projects Currently Advertised Web site
2. For an informal-bid contract, you may obtain them at the Bidders' Exchange street address

01-20-12

Add a paragraph break between the 1st and 2nd sentences of the 5th paragraph of section 2-1.06B.

Add between "and" and "are" in item 2 in the list in the 7th paragraph of section 2-1.06B:

04-20-12

they

06-20-12

Delete "Underutilized" in "Underutilized Disadvantaged Business Enterprises" in the heading of section 2-1.12B.

06-20-12

Delete *U* in *UDBE* at each occurrence in section 2-1.12B.

Replace the 2nd paragraph of section 2-1.12B(1) with:

06-20-12

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

06-20-12

Delete the 3rd paragraph of section 2-1.12B(1):

Replace the 7th paragraph of section 2-1.12B(1) with:

06-20-12

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

Replace "offered" at the end of the 2nd sentence of item 7 in the list of 2nd paragraph of section 2-1.12B(3) with:

06-20-12

provided

01-20-12

Delete the 2nd paragraph of section 2-1.33A.

Replace the 3rd paragraph of section 2-1.33A with:

07-19-13

Except for each subcontracted bid item number and corresponding percentage, do not fax submittals.

Add to section 2-1.33C:

10-19-12

On the *Subcontractor List*, you must either submit each subcontracted bid item number and corresponding percentage with your bid or fax these numbers and percentages to (916) 227-6282 within 24 hours after bid opening. Failure to do so results in a nonresponsive bid.

Replace section 2-1.35 with:

07-19-13

2-1.35 RESERVED

**^^^

Add to item 1 in the list in the 2nd paragraph of section 3-1.18:

07-27-12

, including the attached form FHWA-1273

10-19-12

Delete item 4 of the 2nd paragraph of section 3-1.18.

^^

5 CONTROL OF WORK

07-19-13

Add between "million" and ", professionally" in the 3rd paragraph of section 5-1.09A:

10-19-12

and 100 or more working days

Add to the list in the 4th paragraph of section 5-1.09A:

10-19-12

9. Considering discussing with and involving all stakeholders in evaluating potential VECPs

Add to the end of item 1.1 in the list in the 7th paragraph of section 5-1.09A:

10-19-12

, including VECPs

Replace the 1st paragraph of section 5-1.09C with:

10-19-12

For a contract with a total bid over $10 million and 100 or more working days, training in partnering skills development is required.

10-19-12

Delete the 2nd paragraph of section 5-1.09C.

Replace "at least 2 representatives" in the 5th paragraph of section 5-1.09C with:

10-19-12

field supervisory personnel

Replace the 1st and 2nd sentences in the 7th paragraph of section 5-1.13B(1) with:

06-20-12

If a DBE is decertified before completing its work, the DBE must notify you in writing of the decertification date. If a business becomes a certified DBE before completing its work, the business must notify you in writing of the certification date.

Replace "90" in the last sentence of the 7th paragraph of section 5-1.13B(1) with:

06-20-12

Replace "Underutilized" in "Underutilized Disadvantaged Business Enterprises" in the heading of section 5-1.13B(2) with:

06-20-12

Performance of

06-20-12

Delete *U* in *UDBE* at each occurrence in section 5-1.13B(2).

Replace the 3rd paragraph of section 5-1.13B(2) with:

06-20-12

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

Replace item 6 in the list in the 4th paragraph of section 5-1.13B(2) with:

06-20-12

6. Listed DBE is ineligible to work on the project because of suspension or debarment.

Add to the list in the 4th paragraph of section 5-1.13B(2):

06-20-12

8. Listed DBE voluntarily withdraws with written notice from the Contract.
9. Listed DBE is ineligible to receive credit for the type of work required.
10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.
11. Department determines other documented good cause.

Add between the 4th and 5th paragraphs of section 5-1.13B(2):

07-20-12

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

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

Add between "terminated" and ", you" in the 5th paragraph of section 5-1.13B(2):

07-20-12

or substituted

Replace "Contract" in item 1 in the list in the 5th paragraph of section 5-1.13C with:

10-19-12

work

Replace "Reserved" in section 5-1.20C with:

10-19-12

If the Contract includes an agreement with a railroad company, the Department makes the provisions of the agreement available in the *Information Handout* in the document titled "Railroad Relations and Insurance Requirements." Comply with the requirements in the document.

Add between the 2nd and 3rd paragraphs of section 5-1.23A:

10-19-12

Submit action and informational submittals to the Engineer.

Add between the 5th and 6th paragraphs of section 5-1.23B(1):

07-19-13

For a revised submittal, allow the same number of days for review as for the original submittal.

07-19-13

Delete the 1st sentence in the 10th paragraph of section 5-1.23B(2).

Add to the list in the 1st paragraph of section 5-1.36A:

07-19-13

10. Survey monuments

Add to section 5-1.36C:

07-20-12

If the Contract does not include an agreement with a railroad company, do not allow personnel or equipment on railroad property.

Prevent material, equipment, and debris from falling onto railroad property.

Add to section 5-1.36:

07-19-13

5-1.36E Survey Monuments

Protect survey monuments on and off the highway. Upon discovery of a survey monument not identified and located immediately:

1. Stop work near the monument
2. Notify the Engineer

Do not resume work near the monument until authorized.

Add between the 1st and 2nd paragraphs of section 5-1.37A:

10-19-12

Do not remove any padlock used to secure a portion of the work until the Engineer is present to replace it. Notify the Engineer at least 3 days before removing the lock.

Replace the 1st sentence of the 1st paragraph of section 5-1.39C(2) with:

10-19-12

Section 5-1.39C(2) applies if a plant establishment period of 3 years or more is shown on the *Notice to Bidders*.

Replace "working days" in the 1st paragraph of section 5-1.43E(1)(a) with:

10-19-12

original working days

^^

6 CONTROL OF MATERIALS

07-19-13

Replace section 6-2.05C with:

04-19-13

6-2.05C Steel and Iron Materials

Steel and iron materials must be melted and manufactured in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials
2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or $2,500, materials produced outside the United States may be used if authorized

Furnish steel and iron materials to be incorporated into the work with certificates of compliance and certified mill test reports. Mill test reports must indicate where the steel and iron were melted and manufactured.

All melting and manufacturing processes for these materials, including an application of a coating, must occur in the United States. Coating includes all processes that protect or enhance the value of the material to which the coating is applied.

Replace "Precast concrete members specified section 11-2" in the table in section 6-3.05B with:

07-19-13

Precast concrete members specified as tier 1 or tier 2 in section 90-4.01D(1)

^^

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

07-19-13

Replace "$50" in the 1st sentence in the 6th paragraph of section 7-1.02K(2) with:

07-19-13

$200

Replace "$25" in the 2nd sentence in the 13th paragraph of section 7-1.02K(3) with:

07-19-13

$100

Replace "20 days" in the 14th paragraph of section 7-1.04 with:

09-16-11

25 days

Replace "90 days" in the 14th paragraph of section 7-1.04 with:

09-16-11

125 days

Add between the 18th and 19th paragraphs of section 7-1.04:

09-16-11

Temporary facilities that could be a hazard to public safety if improperly designed must comply with design requirements described in the Contract for those facilities or, if none are described, with standard design criteria or codes appropriate for the facility involved. Submit shop drawings and design calculations for the temporary facilities and show the standard design criteria or codes used. Shop drawings and supplemental calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Replace the 2nd paragraph of section 7-1.11A with:

07-27-12

A copy of form FHWA-1273 is included in section 7-1.11B. The training and promotion section of section II refers to training provisions as if they were included in the special provisions. The Department specifies the provisions in section 7-1.11D of the *Standard Specifications*. If a number of trainees or apprentices is required, the Department shows the number on the *Notice to Bidders*. Interpret each FHWA-1273 clause shown in the following table as having the same meaning as the corresponding Department clause:

FHWA-1273 Nondiscrimination Clauses

FHWA-1273 section	FHWA-1273 clause	Department clause
Training and Promotion	In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.	If section 7-1.11D applies, section 7-1.11D supersedes this subparagraph.
Records and Reports	If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.	If the Contract requires on-the-job training, collect and report training data.

Replace the form in section 7-1.11B with:

07-20-12

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Nonsegregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Compliance with Governmentwide Suspension and Debarment Requirements
XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

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

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;
(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

^^

8 PROSECUTION AND PROGRESS

10-19-12

Replace "working days" in the 1st paragraph of section 8-1.02B(1) with:

10-19-12

original working days

Replace "working days" at each occurrence in the 1st paragraph of section 8-1.02C(1) with:

10-19-12

original working days

04-20-12

Delete the 4th paragraph of section 8-1.02C(1).

Replace "Contract" in the 9th paragraph of section 8-1.02C(1) with:

10-19-12

work

Replace the 1st paragraph of section 8-1.02C(3)(a) with:

04-20-12

Submit a description of your proposed schedule software for authorization.

04-20-12

Delete the last paragraph of section 8-1.02C(3)(a).

Replace section 8-1.02C(3)(b) with:

10-19-12

8-1.02C(3)(b) Reserved

04-20-12

Delete the 3rd paragraph of section 8-1.02C(5).

Replace "Contract" in the last paragraph of section 8-1.02C(5) with:

10-19-12

original

Replace "working days" in the 1st paragraph of section 8-1.02D(1) with:

10-19-12

original working days

Replace "8-1.02D(1)" in the 2nd paragraph of section 8-1.02D(1) with:

01-20-12

8-1.02C(1)

Replace "Contract" in the 3rd paragraph of section 8-1.02D(2) with:

10-19-12

work

Replace "Contract" in item 9 in the list in the 4th paragraph of section 8-1.02D(4) with:

10-19-12

work

Replace "Contract completion" in the 4th paragraph of section 8-1.02D(6) with:

10-19-12

work completion

Replace "Contract working days" in the 4th paragraph of section 8-1.02D(6) with:

10-19-12

original working days

04-20-12

Delete items 1.3 and 1.4 in the list in the 1st paragraph of section 8-1.02D(10).

Replace the last paragraph of section 8-1.04B with:

10-19-12

The Department does not adjust time for starting before receiving notice of Contract approval.

Replace the 1st paragraph of section 8-1.05 with:

10-19-12

Contract time starts on the last day specified to start job site activities in section 8-1.04 or on the day you start job site activities, whichever occurs first.

Replace the 2nd paragraph of section 8-1.05 with:

10-19-12

Complete the work within the Contract time.

10-19-12

Delete "unless the Contract is suspended for reasons unrelated to your performance" in the 4th paragraph of section 8-1.05.

Replace the headings and paragraphs in section 8-1.06 with:

10-19-12

The Engineer may suspend work wholly or in part due to conditions unsuitable for work progress. Provide for public safety and a smooth and unobstructed passageway through the work zone during the suspension as specified under sections 7-1.03 and 7-1.04. Providing the passageway is force account work. The Department makes a time adjustment for the suspension due to a critical delay.

The Engineer may suspend work wholly or in part due to your failure to (1) fulfill the Engineer's orders, (2) fulfill a Contract part, or (3) perform weather-dependent work when conditions are favorable so that weather-related unsuitable conditions are avoided or do not occur. The Department may provide for a

smooth and unobstructed passageway through the work during the suspension and deduct the cost from payments. The Department does not make a time adjustment for the suspension.

Upon the Engineer's order of suspension, suspend work immediately. Resume work when ordered.

Replace the 1st sentence in the 1st paragraph of section 8-1.07B with:

10-19-12

For a critical delay, the Department may make a time adjustment.

Add to the end of section 8-1.07C:

10-19-12

The Department does not make a payment adjustment for overhead incurred during non–working days that extend the Contract into an additional construction season.

Replace the 1st paragraph of section 8-1.07C with:

10-19-12

For an excusable delay that affects your costs, the Department may make a payment adjustment.

Replace "8-1.08B and 8-1.08C" in the 1st paragraph of section 8-1.10A with:

08-05-11

8-1.10B and 8-1.10C

Replace section 8-1.10D with:

10-19-12

8-1.10D Reserved

^^

9 PAYMENT

07-19-13

Add to the list in the 1st paragraph of section 9-1.03:

07-19-13

3. Any royalties and costs arising from patents, trademarks, and copyrights involved in the work

Replace item 1 in the 3rd paragraph of section 9-1.03 with:

01-18-13

1. Full compensation for all work involved in each bid item shown on the Bid Item List by the unit of measure shown for that bid item

Replace "in" in the 3rd paragraph of section 9-1.04A with:

10-19-12

for

Add to the end of section 9-1.04A:

10-19-12

For nonsubcontracted work paid by force account for a contract with a TRO bid item, the markups are those shown in the following table instead of those specified in sections 9-1.04B–D:

Cost	Percent markup
Labor	30
Materials	10
Equipment rental	10

04-20-12

Delete ", Huntington Beach," in the 3rd paragraph of section 9-1.07A.

Replace the formula in section 9-1.07B(2) with:

04-20-12

Qh = *HMATT* x *Xa*

Replace "weight of dry aggregate" in the definition of the variable *Xa* in section 9-1.07B(2) with:

04-20-12

total weight of HMA

Replace the formula in section 9-1.07B(3) with:

04-20-12

Qrh = *RHMATT* x 0.80 x *Xarb*

Replace "weight of dry aggregate" in the definition of the variable *Xarb* in section 9-1.07B(3) with:

04-20-12

total weight of rubberized HMA

Replace the heading of section 9-1.07B(4) with:

04-20-12

Hot Mix Asphalt with Modified Asphalt Binder

Add between "in" and "modified" in the introductory clause of section 9-1.07B(4):

04-20-12

HMA with

Replace the formula in section 9-1.07B(4) with:

04-20-12

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

Replace "weight of dry aggregate" in the definition of the variable *Xmab* in section 9-1.07B(4) with:

04-20-12

total weight of HMA

Replace the formula in section 9-1.07B(5) with:

04-20-12

Qrap = *HMATT* x *Xaa*

Replace "weight of dry aggregate" in the definitions of the variables *Xaa* and *Xta* in section 9-1.07B(5) with:

04-20-12

total weight of HMA

Add after the variable definitions in section 9-1.07B(9):

04-20-12

The quantity of extender oil is included in the quantity of asphalt.

Replace the headings and paragraphs in section 9-1.11 with:

10-19-12

9-1.11A General

Section 9-1.11 applies if a bid item for time-related overhead is included in the Contract. If a bid item for time-related overhead is included, you must exclude the time-related overhead from every other bid item price.

9-1.11B Payment Quantity

The TRO quantity does not include the number of working days to complete plant establishment work.

For a contract with a TRO lump sum quantity on the Bid Item List, the Department pays you based on the following conversions:

1. LS unit of measure is replaced with WDAY
2. Lump sum quantity is replaced with the number of working days bid
3. Lump sum unit price is replaced with the item total divided by the number of working days bid

9-1.11C Payment Inclusions

Payment for the TRO bid item includes payment for time-related field- and home-office overhead for the time required to complete the work.

The field office overhead includes time-related expenses associated with the normal and recurring construction activities not directly attributed to the work, including:

1. Salaries, benefits, and equipment costs of:
   1.1. Project managers
   1.2. General superintendents
   1.3. Field office managers
   1.4. Field office staff assigned to the project
2. Rent
3. Utilities
4. Maintenance
5. Security
6. Supplies
7. Office equipment costs for the project's field office

The home-office overhead includes the fixed general and administrative expenses for operating your business, including:

1. General administration

2. Insurance
3. Personnel and subcontract administration
4. Purchasing
5. Accounting
6. Project engineering and estimating

Payment for the TRO bid item does not include payment for:

1. The home-office overhead expenses specifically related to:
   1.1. Your other contracts or other businesses
   1.2. Equipment coordination
   1.3. Material deliveries
   1.4. Consultant and legal fees
2. Non-time-related costs and expenses such as mobilization, licenses, permits, and other charges incurred once during the Contract
3. Additional overhead involved in incentive/disincentive provisions to satisfy an internal milestone or multiple calendar requirements
4. Additional overhead involved in performing additional work that is not a controlling activity
5. Overhead costs incurred by your subcontractors of any tier or suppliers

9-1.11D Payment Schedule

For progress payments, the total work completed for the TRO bid item is the number of working days shown for the pay period on the *Weekly Statement of Working Days*.

For progress payments, the Department pays a unit price equal to the lesser of the following amounts:

1. Price per working day as bid or as converted under section 9-1.11B.
2. 20 percent of the total bid divided by the number of original working days

For a contract without plant establishment work, the Department pays you the balance due of the TRO item total as specified in section 9-1.17B.

For a contract with plant establishment work, the Department pays you the balance due of the TRO item total in the 1st progress payment after all non–plant establishment work is completed.

9-1.11E Payment Adjustments

The 3rd paragraph of section 9-1.17C does not apply.

The Department does not adjust the unit price for an increase or decrease in the TRO quantity except as specified in section 9-1.11E.

Section 9-1.17D(2)(b) does not apply except as specified for the audit report below.

If the TRO bid item quantity exceeds 149 percent of the quantity shown on the Bid Item List or as converted under section 9-1.11B, the Engineer may adjust or you may request an adjustment of the unit price for the excess quantity. For the adjustment, submit an audit report within 60 days of the Engineer's request. The report must be prepared as specified for an audit report for an overhead claim in section 9-1.17D(2)(b).

Within 20 days of the Engineer's request, make your financial records available for an audit by the State for the purpose of verifying the actual rate of TRO described in your audit. The actual rate of TRO described is subject to the Engineer's authorization.

The Department pays the authorized actual rate for TRO in excess of 149 percent of the quantity shown on the Bid Item List or as converted under section 9-1.11B.

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.

Replace the paragraphs of section 9-1.16D with:

07-19-13

9-1.16D(1) General

Section 9-1.16D applies if a bid item for mobilization is shown on the Bid Item List.

Payments for mobilization made under section 9-1.16D are in addition to the partial payments made under Pub Cont Code § 10261.

Section 9-1.16D(2) applies unless the Contract includes a special provision for section 9-1.16D(1) that specifies section 9-1.16D(3) applies.

9-1.16D(2) Mobilization for Projects Not Over Water Requiring Marine Access

The Department makes partial payments for mobilization under Pub Cont Code § 10264(a) except the amount of work completed does not include the amount earned for mobilization. The partial payment amount is reduced by a prorated amount bid in excess of the maximum allowed under Pub Cont Code § 10264(a)(5).

The Department pays the item total for mobilization in excess of the maximum allowed under Pub Cont Code § 10264(a)(5) in the 1st payment after Contract acceptance.

9-1.16D(3) Mobilization for Projects Over Water Requiring Marine Access

The Department makes partial payments for mobilization under Pub Cont Code § 10264(b) except the amount of work completed does not include the amount earned for mobilization. The partial payment amount is reduced by a prorated amount bid in excess of the maximum allowed under Pub Cont Code § 10264(b)(6).

The Department pays the item total for mobilization in excess of the maximum allowed under Pub Cont Code § 10264(b)(6) in the 1st payment after Contract acceptance.

10-19-12

Delete "revised Contract" in item 1 of the 1st paragraph of section 9-1.16E(2).

Replace "2014" in the 1st paragraph of section 9-1.16F with:

10-19-12

2020

Replace the 2nd paragraph of section 9-1.17C with:

10-19-12

Submit either a written acceptance of the proposed final estimate or a claim statement postmarked or hand delivered before the 31st day after receiving the proposed final estimate.

Add between "the" and "final estimate" in the 1st sentence in the 3rd paragraph of section 9-1.17C:

10-19-12

proposed

Replace the 1st sentence in the 6th paragraph of section 9-1.17D(2)(b) with:

07-19-13

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.

^^^

11 QUALITY CONTROL AND ASSURANCE

07-19-13

Replace section 11-2 with:

07-19-13

11-2 RESERVED

Replace the table in the 3rd paragraph of section 11-3.01A with:

07-19-13

AWS code	Year of adoption
D1.1	2010
D1.3	2008
D1.4	2011
D1.5	2010
D1.6	2007
D1.8	2009

Replace "does" in the definition of "continuous inspection" in section 11-3.01B with:

07-19-13

do

Replace "gross nonconformance" and its definition in section 11-3.01B with:

07-19-13

gross nonconformance: Rejectable indications are present in more than 20 percent of the tested weld length.

Replace the introductory clause in the 1st paragraph of section 11-3.01C with:

07-19-13

Replace clause 6.1.3 of AWS D1.1, the 1st paragraph of clause 7.1.2 of AWS D1.4, and clause 6.1.2 of AWS D1.5 with:

Replace the 3rd paragraph of section 11-3.01C with:

07-19-13

For each inspection, including fit-up, WPS verification, and final weld inspection, the QC Inspector must confirm and document compliance with the specifications, AWS welding codes, and any referenced drawings.

Replace the paragraphs in section 11-3.01D with:

07-19-13

The Engineer has the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means determined by the Engineer. If welding will be performed without gas shielding, then qualification must also include welding without gas shielding.

Replace clause 6.14.6.1 of AWS D1.1, clause 7.8 of AWS D1.4, and clause 6.1.3.4 of AWS D1.5 with:

> Personnel performing NDT must be qualified and certified under American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the written practice of the NDT firm. The written practice of the NDT firm must comply with or exceed the guidelines of the ASNT

Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports must be one of the following:

1. Certified NDT Level II technicians
2. Level III technicians certified to perform the work of Level II technicians

Replace the heading and the 1st through 3rd paragraphs of section 11-3.01E with:

07-19-13

11-3.01E Weld Joint Details

If weld joint details proposed for use in the work are not prequalified under clause 3 of AWS D1.1 or figure 2.4 or 2.5 of AWS D1.5, submit the proposed WPS and the intended weld joint locations.

Upon authorization of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details must weld an additional qualification test plate using the WPS variables and the weld joint detail to be used in production. The test plate must:

1. Have the maximum thickness to be used in production and a minimum length of 18 inches.
2. Be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria must comply with the applicable AWS codes.

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 4.5 of AWS D1.1.

Replace the 1st paragraph of section 11-3.01F with:

07-19-13

Replace paragraph 3 of clause 6.26.3.2 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.). For welds that have transverse cracks, excavate the full length of the crack plus 2 inches of weld metal on each side adjacent to the crack and reweld.

Replace "section" in the 2nd paragraph of section 11-3.01F with:

07-19-13

clause

Replace the 1st paragraph of section 11-3.02A with:

07-19-13

Except for stud welding, section 11-3.02 applies to (1) work welded under sections 49, 52, 55, and 75-1.03E and (2) work in section 99 that must comply with an AWS welding code.

Replace the 4th through 6th paragraphs of section 11-3.02C(2) with:

07-19-13

Submit an amended welding QC plan or an addendum to the welding QC plan for any changes to:

1. WPSs
2. NDT firms
3. QC personnel or procedures

4. NDT personnel or procedures
5. Systems for tracking and identifying welds
6. Welding personnel

Allow 15 days for the Engineer's review of an amended welding QC plan or an addendum to the welding QC plan.

Submit 7 copies of each authorized QC plan and any authorized addendums. Make 1 copy available at each location where work is performed.

Replace the 1st paragraph of section 11-3.02C(3) with:

07-19-13

Submit a welding report within 7 days following the performance of any welding. The welding report must include:

1. Daily production log for welding for each day that welding is performed
2. Reports of all visual weld inspections and NDT performed, whether specified, additional, or informational
3. Radiographs and radiographic reports, and other required NDT reports
4. Summary of welding and NDT activities that occurred during the reporting period
5. Reports of each application of heat straightening
6. Summarized log listing the rejected lengths of weld by welder, position, process, joint configuration, and piece number
7. Documentation that you have:
   7.1. Evaluated all radiographs and radiograph reports and NDT and NDT reports
   7.2. Corrected all rejectable deficiencies and that all repaired welds have been reexamined using the required NDT and found acceptable
8. Reports or chart recordings of each application of any stress relieving used
9. Reports and chart recordings for any electroslag welding used

Add between "radiographic" and "envelopes" in the introductory clause in the 3rd paragraph of section 11-3.02C(3):

07-19-13

film

07-19-13

Delete the 3rd sentence in the 5th paragraph of section 11-3.02C(3).

Replace the introductory clause in the 1st paragraph of section 11-3.02D with:

07-19-13

Clauses 6.1.4.1 and 6.1.4.3 of AWS D1.1, the 2nd paragraph of clause 7.1.2 of AWS D1.4, clauses 6.1.3.1 through 6.1.3.3 of AWS D1.5, and clause 7.2.3 of AWS D1.8 are replaced with:

Replace items 1 and 2 in the list in the 2nd paragraph of section 11-3.02D with:

07-19-13

1. Work is welded at a permanent fabrication or manufacturing plant that is certified under the AISC Certification Program for Steel Bridge Fabricators, Intermediate Bridges, and Fracture-Critical Member endorsement if required.
2. Structural steel for building construction work is performed at a permanent fabrication or manufacturing plant that is certified under the AISC Quality Certification Program, Category STD, Standard for Steel Building Structures.

07-19-13

Delete the 3rd paragraph of section 11-3.02D.

Replace the 1st sentence in the 4th paragraph of section 11-3.02D with:

07-19-13

Except for the exempt facilities identified above, an authorized independent third party must witness the qualification tests for welders or welding operators.

Replace the paragraph in section 11-3.02F with:

07-19-13

Welding procedures qualification for work welded under AWS D1.5 must comply with clause 5.12 or 5.12.4 of AWS D1.5 and the following:

1. Unless considered prequalified, qualify fillet welds in each position. Conduct the fillet weld soundness test using the essential variables of the WPS as established by the PQR.
2. For qualifying joints that do not comply with figures 2.4 and 2.5 of AWS D1.5, conduct the test complying with figure 5.3 using the welding parameters that were established for the test conducted complying with figure 5.1.
3. Macroetch tests are required for WPS qualification tests, and acceptance must comply with clause 5.19.3 of AWS D1.5.
4. If a nonstandard weld joint is to be made using a combination of WPSs, you may conduct a test under figure 5.3, combining the qualified or prequalified WPSs to be used in production, if the essential variables, including weld bead placement, of each process are limited to those established in table 5.3 of AWS D1.5.
5. Before preparing mechanical test specimens, inspect the PQR welds by visual and radiographic tests. The backing bar must be 3 inches in width and must remain in place during NDT. Results of the visual and radiographic tests must comply with clause 6.26.2 of AWS D1.5 excluding clause 6.26.2.2. All other requirements for clause 5.17 are applicable.

Add to the list in the 3rd paragraph of section 11-3.02G:

07-19-13

3. Repairs not included in the welding QC plan

Replace the 1st sentence of the 4th paragraph of section 11-3.02G with:

07-19-13

Requests to perform 3rd-time excavations, repairs of cracks, or repairs not included in the welding QC plan must include an engineering evaluation.

^^

12 TEMPORARY TRAFFIC CONTROL

07-19-13

Replace the 1st paragraph of section 12-3.01A(4) with:

10-19-12

Category 2 temporary traffic control devices must be on FHWA's list of acceptable, crashworthy Category 2 hardware for work zones. This list is available on FHWA's Safety Program Web site.

Replace "project" in the 4th paragraph of section 12-3.02C with:

10-19-12

work

Add after "Display" in item 4 in the list in the 2nd paragraph of section 12-3.03B:

04-19-13

or Alternating Diamond

Replace "project" in the 3rd paragraph of section 12-3.07C with:

10-19-12

work

Add to section 12-3:

07-19-13

12-3.18 AUTOMATED WORK ZONE INFORMATION SYSTEM

Reserved

12-3.19–12-3.25 RESERVED

Replace the 7th through 9th paragraphs of section 12-4.02A with:

07-19-13

If pedestrian traffic is allowed to pass through construction areas, provide a temporary pedestrian facility through the construction areas within the highway. Include protective overhead covering as necessary to ensure protection from falling objects and drippings from overhead structures.

At locations where pedestrian openings through falsework are required, provide a temporary pedestrian facility with protective overhead covering during all bridge construction activities.

Temporary pedestrian facilities must comply with section 12-7.

If an activity requires a closure of a walkway, another walkway must be made available nearby, off of the traveled way.

07-19-13

Delete the 12th paragraph of section 12-4.02A.

Replace section 12-4.03 with:

07-19-13

12-4.03 CLOSURE SCHEDULES AND CONDITIONS

12-4.03A General

Submit closure schedule requests and closure schedule amendments using LCS to show the locations and times of the requested closures.

The Department provides LCS training. Request the LCS training at least 30 days before submitting the 1st lane closure request. The Department provides the training within 15 days after your request. The training may be web based.

Except for web-based training, the training is held at a time and location you and the Engineer agree to.

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 identifications to your assigned, trained representatives.

Each representative must maintain a unique password and current user information in the LCS.

12-4.03B Closure Schedules

Every Monday by noon, submit a closure schedule request of planned closures for the next week period. The next week period is defined as Sunday noon through the following Sunday noon.

Submit a closure schedule request not less than 25 days and not more than 125 days before the anticipated start of any activity that reduces:

1. Horizontal clearances of traveled ways, including shoulders, to 2 lanes or less due to activities such as temporary barrier placement and paving
2. Vertical clearances of traveled way, including shoulders, due to activities such as pavement overlays, overhead sign installation, falsework, or girder erection

Submit closure schedule amendments, including adding 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.

You will be notified through LCS of unauthorized closures or closures that require coordination with other parties as a condition for authorization.

The Engineer may reschedule a closure cancelled due to unsuitable weather.

If a closure is not opened to traffic by the specified time, suspend work. No further closures are allowed until the Engineer has reviewed and authorized a work plan submitted by you that ensures that future closures will be opened to traffic by the specified time. Allow 2 business days for review of your proposed work plan. The Department does not compensate you for your losses due to the suspension of work resulting from the late opening of closures.

Notify the Engineer of delays in your activities caused by:

1. Your closure schedule request being denied although your requested closures are within the specified time frame allowed for closures. The Department does not compensate you for your losses due to amendments to the closure schedule that are not authorized.
2. Your authorized closure being denied.

If you are directed to remove a closure before the time designated in the authorized closure schedule, you will be compensated for the delay.

12-4.03C Contingency Plan

Section 12-4.03C applies 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 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 planned operations. For each activity, identify the critical event when the contingency plan will be activated.

Based on the Engineer's review, additional materials, equipment, workers, or time to complete activities from that specified in the contingency plan may be required.

Submit revisions to a contingency plan at least 3 business days before starting the activity requiring a contingency plan. Allow 2 business days for review of the revised contingency plan.

Replace section 12-7 with:

07-19-13

12-7 TEMPORARY PEDESTRIAN FACILITIES

12-7.01 GENERAL

Section 12-7 includes specifications for constructing temporary pedestrian facilities.

Temporary pedestrian facilities must comply with the *California MUTCD*, Part 6, Chapter 6D, "Pedestrian and Worker Safety."

Design temporary pedestrian facilities with protective overhead covering to support all imposed loads.

The design load and maximum allowable stresses for temporary pedestrian facilities with protective overhead covering must comply with section 48-2.01D(3). The minimum design live load for the temporary pedestrian facilities with protective overhead covering must be 150 psf for the entire structure.

The minimum width of the temporary pedestrian facilities with protective overhead covering between the inside face of handrails must be 60 inches. The clear height of the temporary pedestrian facilities with protective overhead covering measured from the floor surface to the canopy overhead must be at least 8 feet. Provide adequate lighting at all times. Lighting must comply with section 86-6.13.

Submit shop drawings with supporting calculations for temporary pedestrian facilities with protective overhead covering. Shop drawings and calculations must be signed by an engineer who is registered as a civil engineer in the State.

12-7.02 MATERIALS

Walkways must be surfaced with HMA, portland cement concrete, or wood. The surface must be skid resistant and free of irregularities.

Hand railings must be S4S lumber and painted white.

Protective overhead covering of temporary pedestrian facilities must be plywood at least 3/4 inch thick or wood planking with a nominal thickness of 2 inches minimum.

12-7.03 CONSTRUCTION

Construct hand railings on each side of a temporary pedestrian facility as necessary to protect pedestrian traffic from hazards due to work activities or adjacent vehicular traffic.

Maintain temporary pedestrian facilities in good condition and keep them clear of obstructions.

12-7.04 PAYMENT

Not Used

^^

13 WATER POLLUTION CONTROL

07-19-13

04-19-13

Delete item 3 in the list in the 4th paragraph of section 13-1.01A.

Add to section 13-1.01A:

01-20-12

Comply with the Department's general permit issued by the State Water Resources Control Board for *Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)*. The Department's general permit governs stormwater and nonstormwater discharges from the Department's properties, facilities, and activities. The Department's general permit may be viewed at the Web site for the State Water Resources Control Board, Storm Water Program, Caltrans General Permit.

Add to the list in the 1st paragraph of section 13-1.01D(3)(b):

10-21-11

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

Add to the list in the 2nd paragraph of section 13-1.01D(3)(b):

10-21-11

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

Replace "NEL violation" in item 3.6.2 in the list in the 1st paragraph of section 13-1.01D(3)(c) with:

04-19-13

receiving water monitoring trigger

Replace the 1st paragraph in section 13-2.01B with:

04-19-13

Within 7 days after Contract approval, submit 2 copies of your WPCP for review. Allow 5 business days for review.

After the Engineer authorizes the WPCP, submit an electronic copy and 3 printed copies of the authorized WPCP.

If the RWQCB requires review of the authorized WPCP, the Engineer submits the authorized WPCP to the RWQCB for its review and comment. If the Engineer orders changes to the WPCP based on the RWQCB's comments, amend the WPCP within 3 business days.

Replace the 1st paragraph in section 13-3.01B(2)(a) with:

04-19-13

Within 15 days of Contract approval, submit 3 copies of your SWPPP for review. The Engineer provides comments and specifies the date when the review stopped if revisions are required. Change and resubmit a revised SWPPP within 15 days of receiving the Engineer's comments. The Department's review resumes when a complete SWPPP has been resubmitted.

When the Engineer authorizes the SWPPP, submit an electronic copy and 4 printed copies of the authorized SWPPP.

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

Replace "NELs" in item 3.1 in the 3rd paragraph of section 13-3.01B(2)(a) with:

04-19-13

receiving water monitoring triggers

Replace section 13-3.01B(6)(c) with:

04-19-13

13-3.01B(6)(c) Receiving Water Monitoring Trigger Report

Whenever a receiving water monitoring trigger is exceeded, notify the Engineer and submit a receiving water monitoring trigger report within 48 hours after conclusion of a storm event. The report must include:

1. Field sampling results and inspections, including:
   1.1. Analytical methods, reporting units, and detection limits
   1.2. Date, location, time of sampling, visual observation and measurements
   1.3. Quantity of precipitation from the storm event
2. Description of BMPs and corrective actions

Replace "NEL" in the 6th paragraph of section 13-3.01C(1) with:

04-19-13

receiving water monitoring trigger

Replace section 13-3.01C(3) with:

04-19-13

13-3.01C(3) Receiving Water Monitoring Trigger

For a risk level 3 project, receiving water monitoring triggers must comply with the values shown in the following table:

Receiving Water Monitoring Trigger

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

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

The daily average sampling results must not exceed the receiving water monitoring trigger for pH.

04-19-13

Delete "and NELs are violated" in the 3rd paragraph of section 13-3.03C.

Replace "working days" at each occurrence in section 13-3.04 with.

10-19-12

original working days

04-19-13

Delete the 1st sentence in the 2nd paragraph of section 13-4.03C(3).

Add between the 2nd and 3rd paragraphs of section 13-4.03C(3):

04-19-13

Manage stockpiles by implementing water pollution control practices on:

1. Active stockpiles before a forecasted storm event
2. Inactive stockpiles according to the WPCP or SWPPP schedule

Replace the paragraph in section 13-4.04 with:

04-20-12

Not Used

Replace "20-7.02D(6)" in section 13-5.02C with:

07-19-13

20-5.03E

10-19-12

Delete "or stockpile" in the 3rd paragraph of section 13-5.02F.

Replace "20-7.03I(10)" in section 13-5.03C with:

07-19-13

20-5.03E(3)

Replace section 13-5.03F with:

04-20-12

13-5.03F Reserved

10-19-12

Delete "or stockpile" in item 1 in the list in the 1st paragraph of section 13-5.03K.

10-19-12

Delete the 3rd paragraph of section 13-5.03K.

Replace the 2nd sentence in the 1st paragraph of section 13-9.01A with:

10-19-12

You may use any of the following systems for temporary concrete washout:

1. Temporary concrete washout facility
2. Portable temporary concrete washout
3. Temporary concrete washout bin

Replace the 2nd paragraph of section 13-9.01B with:

10-19-12

Retain and submit an informational submittal for records of disposed concrete waste.

10-19-12

Delete the 4th paragraph of section 13-9.01B.

10-19-12

Delete "if authorized" in the 1st sentence in the 1st paragraph of section 13-9.02A.

Replace "at least 3-inch" in the 3rd sentence in the 1st paragraph of section 13-9.02A with:

10-19-12

6-inch

^^

15 EXISTING FACILITIES

07-19-13

Replace section 15-1.03D with:

07-19-13

15-1.03D Reserved

Replace "metal beam guard railing" in the 1st paragraph of section 15-2.01C with:

07-19-13

guardrail

Replace the paragraphs of section 15-2.02B(1) with:

07-19-13

Section 15-2.02B includes specifications for removing pavement, base, subbase, and subgrade.

If only a portion of the pavement is removed, saw-cut the outline of the removal area on a neat line and with a power-driven saw before removing.

For asphalt concrete pavement, saw cuts must be at least 2 inches deep unless otherwise described.

Replace section 15-2.02B(4)(b) with:

07-19-13

15-2.02B(4)(b) Reserved

Add to section 15-2.02B:

07-19-13

15-2.02B(5) Remove Concrete Pavement

15-2.02B(5)(a) General

Remove only the portion of pavement to be replaced or repaired during the same lane closure. If there is overlying material on the concrete pavement, remove it with the pavement.

Do not impact the surface within 18 inches of the pavement to remain in place. Use removal methods that do not damage the remaining pavement and base. Slab-lifting equipment must attach to the pavement.

Instead of disposing of removed concrete pavement by removing it from the job site, you may dispose of it under section 15-3.01.

15-2.02B(5)(b) Saw Cuts

Saw cut using a diamond blade and make cuts perpendicular to the pavement surface. Saw cutting is not required where concrete pavement is adjacent to asphalt concrete pavement.

Saw cut (1) no more than 2 days before removing pavement and (2) such that traffic will not dislodge any pavement piece or segment. Saw cut perpendicular to the traveled way except you may cut parallel or diagonal to the traveled way when removing the pavement during the same lane closure as the saw cutting.

You may make additional saw cuts within the sawed outline.

Saw cuts must be the full depth of the pavement unless otherwise shown.

Saw cut at longitudinal and transverse joints to remove entire slabs. For partial-slab areas, the Engineer determines the exact saw-cut locations.

15-2.02B(5)(c) Reserved

15-2.02B(6) Reserved

15-2.02B(7) Payment

Reserved

Replace section 15-2.02G with:

07-19-13

15-2.02G Remove Guardrail

Where removing guardrail, remove any concrete anchors and steel foundation tubes.

Replace the 1st paragraph of section 15-2.02K with:

07-19-13

Box culverts, concrete pipes, inlets, headwalls, and endwalls must be completely removed if any portion of these structures is (1) within 3 feet of the grading plane in excavation areas, (2) within 1 foot of original ground in embankment areas, or (3) shown to be removed.

Replace "Metal beam guard railing" in the table in the 2nd paragraph of section 15-2.03A(2)(a) with:

07-19-13

Guardrail

Replace the heading of section 15-2.03B with:

07-19-13

Salvage Guardrail

Replace the heading of section 15-2.04D with:

07-19-13

Reconstruct Guardrail

Replace section 15-2.09D with:

07-19-13

15-2.09D Reserved

Replace the 4th paragraph of section 15-2.10B with:

01-18-13

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

Replace the heading of section 15-2.10D with:

07-19-13

Adjust Guardrail

Replace the paragraphs of section 15-3.01 with:

07-19-13

Section 15-3 includes specifications for removing all or a portion of a concrete facility.

Concrete facilities include curbs, gutters, gutter depressions, sidewalks, driveways, slope paving, island paving, barriers, retaining walls, sound walls, minor structures, aprons, spillways, and dams.

Where broken-concrete slope protection is shown, use removed concrete for the construction of the broken-concrete slope protection.

Instead of disposing of removed concrete by removing it from the job site, you may dispose of it on the job site by one of the following methods:

1. Burying it in embankments at authorized locations. Removed concrete must be broken into pieces that can be readily handled and incorporated into embankments and placed at a depth of at least 3 feet below finished grade and slope lines. Concrete must not be buried in areas where piling is to be placed or within 10 feet of trees, pipelines, poles, buildings or other permanent objects or structures.
2. Placing it at authorized locations. The removed concrete must not present an unsightly appearance from the highway.

Replace the paragraph of section 15-3.02 with:

07-19-13

Not Used

07-19-13

Delete the 5th paragraph of section 15-3.03.

Add to the end of section 15-4.01A(2):

04-19-13

Allow 20 days for review of the bridge removal work plan.

Replace the 1st paragraph of section 15-5.01C(1) with:

10-19-12

Before starting deck rehabilitation activities, complete the removal of any traffic stripes, pavement markings, and pavement markers.

Replace the 2nd and 3rd paragraphs of section 15-5.01C(2) with:

10-19-12

Perform the following activities in the order listed:

1. Abrasive blast the deck surface with steel shot. Perform abrasive blasting after the removal of any unsound concrete and placement of any rapid setting concrete patches.
2. Sweep the deck surface.
3. Blow the deck surface clean using high-pressure air.

Replace the 2nd paragraph of section 15-5.01C(4) with:

10-19-12

Before removing asphalt concrete surfacing, verify the depth of the surfacing at the supports and midspans of each structure (1) in each shoulder, (2) in the traveled way, and (3) at the roadway crown, if a crown is present.

04-19-13

Delete "and concrete expansion dams" in the 3rd paragraph of section 15-5.01C(4).

Replace the 2nd paragraph of section 15-5.03A(2) with:

10-19-12

For a contract with less than 60 original working days, submit certificates of compliance for the filler material and bonding agents.

Replace "51-1.02C" in the 1st paragraph of section 15-5.03B with:

04-19-13

51-1.02F

Replace the 4th paragraph of section 15-5.03B with:

10-19-12

For a contract with less than 60 original working days, alternative materials must be authorized before use.

Add between the 5th and 6th paragraphs of section 15-5.03C:

10-19-12

The final surface finish of the patched concrete surface must comply with section 51-1.03F.

10-19-12

Delete the 4th paragraph of section 15-5.05C.

Replace "51-1.03F(5)" in the 3rd paragraph of section 15-5.06C(1) with:

07-19-13

51-1.01D(4)(b)

Replace "51-1.03E(5)" in the 5th paragraph of section 15-5.06C(1) with:

10-19-12

51-1.03F(5)

10-19-12

Delete the 9th paragraph of section 15-5.06C(1).

04-19-13

Delete the 15th paragraph of section 15-5.06C(1).

Add between the 18th and 19th paragraphs of section 15-5.06C(1):

07-19-13

Texture the polyester concrete surface before gelling occurs by longitudinal tining under 51-1.03F(5)(b)(iii), except do not perform initial texturing.

Replace section 15-5.06C(2) with:

04-19-13

15-5.06C(2) Reserved

04-19-13

Delete the 3rd paragraph of section 15-5.06D.

Replace the 1st paragraph in section 15-5.07B(4) with:

10-19-12

Payment for furnishing dowels is not included in the payment for core and pressure grout dowel.

Replace section 15-5.09 with:

04-19-13

15-5.09 POLYESTER CONCRETE EXPANSION DAMS

15-5.09A General

Section 15-5.09 includes specifications for constructing polyester concrete expansion dams.

Polyester concrete expansion dams must comply with the specifications for polyester concrete overlays in section 15-5.06, except a trial slab is not required.

Reinforcement must comply with section 52.

15-5.09B Materials

Not Used

15-5.09C Construction

For new asphalt concrete overlays, place the asphalt concrete overlay before starting polyester concrete activities. Saw cut and remove asphalt concrete at expansion dam locations.

For existing asphalt concrete overlays, remove expansion dams and asphalt concrete to the limits shown. Removing expansion dams must comply with section 15-4 except a bridge removal work plan is not required.

Where a portion of the asphalt concrete overlay is to remain, saw cut a 2-inch-deep neat line along the edge to remain in place before removing the asphalt concrete. Do not damage the existing surfacing to remain in place.

Prepare the deck surface under section 15-5.01C(2).

You may use a mechanical mixer to mix the polyester concrete for expansion dams. The mixer capacity must not exceed 9 cu ft unless authorized. Initiate the resin and thoroughly blend it immediately before mixing it with the aggregate. Mix the polyester concrete for at least 2 minutes before placing.

The application rate of methacrylate resin must be approximately 100 sq ft/gal.

You may place and finish expansion dams using hand methods.

Protect expansion dams from moisture, traffic, and equipment for at least 4 hours after finishing.

For expansion dams over 6 feet long, install 1/4-inch-wide joint material at 6-foot intervals across the width of the expansion dam. Joint material must be either expanded polyurethane or expanded polyethylene.

15-5.09D Payment

Not Used

Add to section 15-6.01A(3)(a):

07-19-13

Within 5 days of completing annular space grouting at a culvert, submit the grouting records.

Replace "41-1.01" in item 10.3 in the list in the 2nd paragraph of section 15-6.01A(3)(d) with:

07-19-13

41-2

Replace "41-1.02" in 1st paragraph of section 15-6.01B(2) with:

07-19-13

41-2

Replace the heading of section 15-6.04 with:

01-18-13

INVERT PAVING

Replace the 1st paragraph of section 15-6.13A(1) with:

07-19-13

Section 15-6.13 includes specifications for installing machine spiral wound PVC pipeliners directly into the culvert.

Replace the heading of section 15-6.13B with:

07-19-13

Machine Spiral Wound PVC Pipeliners, Grouted

^^^

For ground anchor walls, a wall zone is the entire wall unless otherwise specified in the special provisions.

01-20-12

Delete the 2nd sentence in the 4th paragraph of section 19-3.01A(3)(b).

Replace "90" in the paragraph of section 19-3.02G with:

01-18-13

90-1

Add to section 19-3.02:

07-19-13

19-3.02I Filter Fabric

Filter fabric must be Class A.

Replace the heading of section 19-3.03C with:

04-19-13

19-3.03B(4) Cofferdams

Replace the heading of section 19-3.03D with:

04-19-13

19-3.03B(5) Water Control and Foundation Treatment

Replace the 1st paragraph of section 19-3.03E(3) with:

01-20-12

Compact structure backfill behind lagging of soldier pile walls by hand tamping, mechanical compaction, or other authorized means.

Add to the end of section 19-3.03E(3):

07-19-13

If filter fabric is shown behind the lagging:

1. Immediately before placing the filter fabric, remove any loose or extraneous material and sharp objects from the surface to receive the filter fabric.
2. Handle and place the filter fabric under the manufacturer's instructions. Stretch, align, and place the fabric without wrinkling.
3. Stitch the adjacent borders of filter fabric or overlap the adjacent borders by 12 to 18 inches. If stitching the border, use yarn of a contrasting color. Yarn size and composition must be as recommended by the fabric manufacturer. Use 5 to 7 stitches per inch of seam.
4. Repair any damaged filter fabric by placing a piece of filter fabric large enough to cover the damaged area and comply with the overlapping or stitching requirements.

Replace the 2nd paragraph of section 19-3.03F with:

01-20-12

Do not backfill over or place material over slurry cement backfill until 4 hours after placement. When concrete sand is used as aggregate and the in-place material is free draining, you may start backfilling as soon as the surface water is gone.

Add between the 2nd and 3rd paragraphs of section 19-3.03K:

01-20-12

Before you excavate for the installation of ground anchors in a wall zone:

1. Complete stability testing
2. Obtain authorization of test data

Replace the 2nd sentence of the 7th paragraph of section 19-3.03K:

01-20-12

Stop construction in unstable areas until remedial measures have been taken. Remedial measures must be submitted and authorized.

Add between the 8th and 9th paragraphs of section 19-3.03K:

01-20-12

When your excavation and installation methods result in a discontinuous wall along any soil nail row, the ends of the structurally completed wall section must extend beyond the ends of the next lower excavation lift by a distance equal to twice the lift height. Maintain temporary slopes at the ends of each wall section to ensure slope stability.

Replace the 9th paragraph of section 19-3.03K:

01-20-12

Do not excavate to the next underlying excavation lift until the following conditions have been attained for the portion of the soil nail or ground anchor wall in the current excavation lift:

1. Soil nails or ground anchors are installed and grouted.
2. Reinforced shotcrete facing is constructed.

01-18-13

3. Grout and shotcrete have cured for at least 72 hours.

01-20-12

4. Specified tests are complete for that portion of wall and the results are authorized.
5. Soil nail facing anchorages are attached or ground anchors are locked off.

Replace the 2nd sentence in the 7th paragraph of section 19-3.04 with:

01-18-13

Structure excavation more than 0.5 foot from the depth shown is paid for as a work-character change if you request an adjustment or the Engineer orders an adjustment.

Replace "Contract completion time" in the 8th paragraph of section 19-6.03D with:

10-19-12

work completion date

Add to section 19:

01-18-13

19-10–19-20 RESERVED

^^

20 LANDSCAPE

07-19-13

Replace the headings and paragraphs in section 20 with:

07-19-13

20-1 GENERAL

20-1.01 GENERAL

20-1.01A Summary

Section 20-1 includes general specifications for performing landscaping.

If an irrigation system is to be installed in an existing planting area to be maintained, check for plant deficiencies under section 20-3.02A(4) before starting irrigation work.

Perform a functional test for each irrigation system under 20-2.01A(4)(d):

1. Before planting the plants
2. After planting the plants
3. Before the start of the plant establishment work

If a plant is to be transplanted or an irrigation component is to be relocated, transplant plant or protect irrigation components before performing other construction activities in the area.

Perform roadside clearing:

1. As required to prepare the job site for construction work
2. Until the start of the plant establishment work or Contract acceptance, whichever comes first

20-1.01B Definitions

Reserved

20-1.01C Submittals

At least 15 days before applying any pesticide, submit a copy of the licensed pest control adviser's recommendation.

At the end of each week, submit a report documenting the application of all pesticides as an informational submittal. Use form *Report of Chemical Spray Operations*.

Before mixing a pesticide, submit a copy of the registered label for the pesticide as an informational submittal. If unable to copy, allow the Engineer to read the label on the container.

20-1.01D Quality Control and Assurance

20-1.01D(1) General

Obtain a recommendation from a licensed pest control adviser for the use of all pesticides under the Food & Agri Code. The recommendation must include the pesticides to be used, rates of application, methods of application, and application areas.

The pesticide applicator must have an active and valid qualified applicator license or certificate from the Department of Pesticide Regulation.

20-1.01D(2) Progress Inspections

The Engineer will perform progress inspections before:

1. Cultivating work starts
2. Pressure testing of irrigation pipe on the supply side of control valves
3. Testing of low voltage conductors
4. Planting work starts
5. Completion of planting work

Notify the Engineer at least 4 business days before each inspection is required. Allow at least 3 business days for the Engineer's inspection.

Unless otherwise authorized, do not proceed with the next construction activity until the inspection has been completed and any required corrective work has been performed and authorized.

20-1.02 MATERIALS

20-1.02A General

Reserved

20-1.02B Water

Water available from an existing Department-owned facility within the project limits or an irrigation system to be installed under the Contract is furnished at no charge.

If water is not available, make arrangements for supplying water. Water must be of a quality that will promote plant growth.

20-1.02C Pesticides

Pesticides must comply with the Department of Pesticide Regulation.

Insecticide must be imidacloprid.

Rodenticides must be brodifacoum, bromadiolone, or diphacinone.

Do not use oil or pelleted forms of pesticides for weed control.

For weed control, use a pesticide with a photosensitive dye that produces a contrasting color when sprayed on the ground. The color must disappear between 2 to 3 days after being applied. The dye must not stain surfaces or injure plants or wildlife when applied at the manufacturer's recommended application rate.

20-1.03 CONSTRUCTION

20-1.03A General

Take precautions to prevent irrigation water from:

1. Wetting vehicles, pedestrians, and pavement
2. Eroding soil

Dispose of removed, pruned, and damaged vegetative material.

You may reduce removed vegetative material to chips with a maximum thickness of 1/2 inch and spread within the job site at locations determined by the Engineer. Chipped material must not be substituted for wood mulch, nor must the chipped material be placed within areas to receive wood mulch.

20-1.03B Pesticides

Notify the Engineer of pesticide application times at least 24 hours before each application.

Mix and apply pesticides under the requirements of the Department of Pesticide Regulation and the instructions on the pesticide product label.

Do not apply pesticides:

1. On Saturdays and holidays unless authorized
2. Whenever weather and wind conditions are unsuitable for application
3. Within the plant basin
4. On the foliage and woody parts of the plant

If a granular preemergent is used, it must be covered with mulch on the same work day. Do not apply granular preemergent in plant basins.

Do not apply preemergents:

1. To groundcover plants before the plants have been planted a minimum of 3 days and have been thoroughly watered
2. Within 18 inches of trees, shrubs, and seeded areas

20-1.03C Roadside Clearing

20-1.03C(1) General

Perform roadside clearing by:

1. Removing and disposing of trash and debris
2. Controlling the following pests:
   2.1. Rodents
   2.2. Insects
   2.3. Weeds
3. Removing existing plants as described

Control rodents by using rodenticides or traps.

20-1.03C(2) Remove Existing Plants

Remove existing plants as described. Removal of existing plants includes removing their stumps and roots 2 inches or larger in diameter to a minimum depth of 12 inches below finished grade. Backfill holes resulting from stump removal to finished grade with material obtained from adjacent areas.

If a plant is to be planted within existing groundcover area, remove existing groundcover from within an area 6 feet in diameter centered at each plant location.

20-1.03C(3) Weed Control

Control weeds by the use of pesticides, hand pulling, or mowing.

If pesticides are used to control weeds, apply pesticides before the weeds reach the seed stage of growth or exceed 4 inches in length, whichever occurs first. Do not use pesticides at cutting plant locations.

Where cuttings are to be planted, control weeds by hand pulling within an area 2 feet in diameter centered at each plant location.

If weeds are to be controlled by hand pulling, hand pull weeds before they reach the seed stage of growth or exceed 4 inches in length, whichever occurs first.

Where liner, plug, or seedling plants are to be planted 10 feet or more apart, control weeds by the use of pesticides or hand pulling within an area 2 feet in diameter centered at each plant location. Where liner, plug, or seedling plants are to be planted less than 10 feet apart, control weeds by the use of pesticides within the entire area.

Control weeds by mowing outside of mulched areas, plant basins, groundcover areas, and within areas to be seeded. Mowing must extend to the edges of pavement, dikes, curbs, sidewalks, walls, and fences.

If mowing is to be performed within areas to be seeded, perform mowing as needed until the start of the seeding operation specified in section 21.

Mowing must be performed before the weeds reach the seed stage of growth or exceed 6 inches in length, whichever occurs first. Mow weeds to a height of 3 inches.

20-1.03C(4) Disposal of Removed Groundcover, Weeds, and Mowed Material

Dispose of hand pulled weeds the same day they are pulled. Dispose of removed groundcover within 3 days.

Dispose of mowed material from the initial mowing. Disposal of material from subsequent mowing is not required.

20-1.03D Cultivation

Cultivation must be by mechanical methods and performed until the soil is in a loose condition to a minimum depth of 6 inches. Soil clods must not be larger than 2 inches in maximum dimension after cultivation.

The areas to be cultivated must extend 12 inches beyond the outer limit of each planting area requiring cultivation.

After initial cultivation, place soil amendment and fertilizer at specified rates.

Recultivate to thoroughly mix native soil and amendments.

Do not drive on cultivated areas after cultivation.

Planting areas that have been cultivated and become compacted must be recultivated.

Rocks and debris encountered during soil preparation in planting areas must be brought to the surface of the ground.

Remove rocks and debris as ordered. This work is change order work.

20-1.03E Weed Germination

Reserved

20-1.04 PAYMENT

Items paid for by area are measured parallel to the ground surface.

Planting areas that do not require cultivation but are within the cultivation areas will not be deducted.

20-2 IRRIGATION

20-2.01 GENERAL

20-2.01A General

20-2.01A(1) Summary

Section 20-2 includes specifications for installing irrigation systems.

The irrigation systems shown are diagrammatic.

20-2.01A(2) Definitions

Reserved

20-2.01A(3) Submittals

20-2.01A(3)(a) General

Submit shop drawings for the electrical components of the irrigation system except electrical service 30 days before installation. The drawings must:

1. Include schematic wiring diagrams showing wire sizes and routes between electrical components
2. Show conduit sizes
3. Bear the written approval of the controller manufacturer or the manufacturer's authorized agent
4. Be accompanied by:
   - 4.1. Colored wire and splice samples
   - 4.2. Manufacturer's descriptive and technical literature

After the work shown on the drawing is complete, submit 3 copies of the as-built shop drawings including any wire modifications for each controller installed.

For each controller, laminate and place in an envelope 1 copy of:

1. As-built schematic wiring diagram including wiring modifications
2. 11 by 17 inches as-built irrigation plan

The laminate must be clear, mat-finished plastic that is at least 10 mils thick. The envelope must be heavy-duty plastic.

Attach the envelope to the inside of the controller enclosure or cabinet door. If the door is not large enough to secure the envelope, submit the envelope and its contents.

20-2.01A(3)(b) Manufacturer's Instructions

Submit as an informational submittal the manufacturer's installation instructions 15 days before installing:

1. Couplings for conduits used for irrigation conduits
2. Plastic pipe and fittings
3. Solvent cement for plastic pipe and flexible hose
4. Sprinklers
5. Flow sensors

20-2.01A(3)(c) Maintenance and Operation Manuals

Before Contract acceptance, submit as an informational submittal a manufacturer's maintenance and operation manual for each type of controller installed.

20-2.01A(4) Quality Control and Assurance

20-2.01A(4)(a) General

Reserved

20-2.01A(4)(b) Pressure Testing

20-2.01A(4)(b)(i) General

Perform pressure testing for leakage on irrigation supply lines:

1. In the Engineer's presence
2. On business days between 8 a.m. and 5 p.m. unless authorized
3. Before backfilling supply line trenches
4. With irrigation system gate valves open
5. With open ends of the supply line and fittings plugged or capped

Notify the Engineer at least 48 hours before performing a pressure test.

Choose either Method A or B to test supply lines installed by trenching and backfilling and supply lines that are completely visible after installation.

All other supply lines, including those installed in the ground by methods other than trenching and backfilling must be tested by Method A.

Test irrigation supply line in conduit by Method A with the testing period modified to 0.5 hour and no allowable pressure drop.

20-2.01A(4)(b)(ii) Method A

Method A pressure testing procedures for leakage must comply with the following:

1. Pressure gauge must be calibrated from 0 to 200 psi in 5 psi increments and be accurate to within a tolerance of 2 psi.
2. Supply line must be filled with water and connected to a pressure gauge. Place the pipeline under a pressure of 125 psi. Remove the source of pressure and leave the line under the required pressure.
3. Test the supply line under the required pressure for a period of 1 hour. The pressure gauge must remain in place until each test period is complete.
4. Leaks that develop in the tested portion of the system must be located and repaired after each test period if a drop of more than 5 psi is indicated by the pressure gauge. After the leaks have been repaired, repeat the 1 hour pressure test until the drop in pressure is 5 psi or less.

If a system consists of a new supply line connected to an existing line, the new supply line must be isolated from the existing line and tested.

20-2.01A(4)(b)(iii) Method B

Method B pressure testing procedures for leakage must comply with the following:

1. Before any portion of the supply line on the upstream side of a control valve is backfilled, water must be turned on for that portion of the line and maintained at full pressure from the water source for a period not less than 8 consecutive hours after all air has been expelled from the line. Before any

portion of the supply line on the downstream side of the control valve is backfilled, perform the same test for a period not less than 1 hour.
2. Repair leaks that develop in the tested portion of the system. After the leaks have been repaired, repeat the pressure test until no leaks occur as determined by the Engineer.

20-2.01A(4)(c) Sprinkler Coverage Check

After installation of the sprinklers, check and adjust the entire sprinkler system for proper orientation and uniform coverage.

20-2.01A(4)(d) Irrigation System Functional Tests

The functional tests for each irrigation controller or group of controllers and associated irrigation system served by a single electric service point must consist of at least 1 complete cycle of operation. The Engineer determines the length of the cycle.

Notify the Engineer at least 10 days before performing each functional test.

20-2.01A(4)(e) Final Irrigation System Check

Perform the final check of the existing and new irrigation system between 20 and 30 days before Contract acceptance. The Engineer determines the length of the cycle.

Remote control valves connected to existing and new irrigation controllers must be checked for automatic operation when the controllers are in automatic mode.

20-2.01B Materials

20-2.01B(1) General

Use minor concrete for replacing removed concrete facilities.

HMA for replacing removed asphalt concrete surfacing and facilities must comply with section 39. You may use minor HMA if authorized.

20-2.01B(2) Garden Valves

Each garden valve must:

1. Be inverted nose type and of brass or bronze construction with female thread inlet
2. Have a replaceable seat washer, rising valve stem within a protective collar, and male thread hose outlet
3. Have a loose key handle

20-2.01B(3) Recycled Water Identification

Irrigation components used for recycled water must be manufactured or painted purple. Recycled water irrigation pipe and tubing must have a permanent label with the wording "CAUTION RECYCLED WATER" every 24 inches in 2 rows spaced approximately 180 degrees apart in the longitudinal direction of the pipe or tubing.

The recycled water warning sign must be a decal or a decal attached to a 1/16-inch thick aluminum plate or tag.

Each warning sign decal must:

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, black text, and self-adhesive backing

Each warning tag must:

1. Show the phrase "RECYCLED WATER" and the drinking glass graphic symbol
2. Be UV fade and weather resistant
3. Be purple, double-sided, and manufactured from polyurethane
4. Have an integral neck attachment and attachment hole capable of withstanding 178 lb of pull-out resistance
5. Have hot-stamped black lettering

Posts and hardware for warning signs must comply with section 56-4.

Concrete sprinkler protectors used with recycled water must be painted purple.

20-2.01B(4) Location Markers

Location markers must be schedule 40 white PVC plastic pipe.

20-2.01B(5) Pull Boxes

Pull boxes must comply with section 86-2.06 and be no. 5 or larger unless otherwise shown. Pull boxes for low voltage conductors must not have side openings.

Pull box covers used solely for irrigation electrical service must be marked "IRRIGATION".

20-2.01B(6) Unions

Unions must be brass or malleable iron capable of withstanding the maximum required working pressure.

20-2.01B(7) Valve Boxes and Covers

Valve boxes must be precast concrete.

Covers must be:

1. Concrete, steel, or cast iron.
2. Marked "WATER" in cast-in letters not less than 1 inch high.
3. 1 piece, except 2 pieces are required when the weight of the valve box cover exceeds 35 lb.

The valve box covers must include a polyurethane label with the appropriate controller letter and station number as shown.

20-2.01B(8) Wye Strainers

Wye strainers must:

1. Have a cast iron or all bronze body
2. Have a removable stainless steel strainer screen:
   - 2.1. With an open area equal to at least 3 times the cross-sectional area of the pipe based on an iron pipe size
   - 2.2. With 40-mesh woven wire, except:
     - 2.2.1. For a backflow preventer assembly, the screen must be 20-mesh woven wire mesh or perforated sheet with 0.045-inch diameter holes
     - 2.2.2. For a valve assembly, the screen must be 80-mesh woven wire mesh
3. Be capable of withstanding a working pressure of 150 psi
4. Be equipped with a garden valve at the outlet

The wye strainer filter housing must:

1. Withstand a working pressure of 150 psi
2. Be manufactured of reinforced polypropylene plastic

20-2.01C Construction

20-2.01C(1) General

Repair irrigation systems within 24 hours after a malfunction or damage occurs.

Connect underground metallic pipes, valves, or fittings made of dissimilar metals through a dielectric coupling or bushing.

You may install conduits, conductors, and supply lines by methods other than trenching provided that they are not damaged and are installed at the depths specified.

20-2.01C(2) Trenching and Backfilling

Trench and backfill under section 86-2.01.

Remove plants under 20-1.03C as necessary to perform trenching. If plants are to remain, adjust trench alignment to minimize damage.

If removal of:

1. Turf is required, remove to a maximum width of 12 inches.
2. Groundcover is required, remove to a maximum width of 6 feet. Existing *Carpobrotus* and *Delosperma* may be rototilled if the backfill for the trenches does not contain plants longer than 6 inches in length.

Make a 2-inch deep sawcut along neat lines around the perimeter of the pavement to be removed at locations determined by the Engineer.

The trench must have uniform bearing throughout the entire length and must be free of jagged rubble or sharp objects. Ensure conduit, supply line, and joints are not moved or damaged by backfill operations.

For a project with multiple water service points, excavate and backfill trenches for 1 service point at a time.

Trenches for irrigation supply lines and conduits 2-1/2 inches and larger must be 5 times the pipe or conduit diameter deep and 2 times the pipe or conduit diameter wide.

Trenches for irrigation supply lines and conduits 2 inches or less in diameter must be a minimum of 12 inches below finished grade, measured from the top of the installed pipe.

Trenches must be at least 4 feet from curbs, dikes, and paved shoulders.

Rocks and debris encountered during trenching operations must be brought to the surface of the ground. Remove rocks and debris as ordered. This work is change order work.

If trenching requires the removal of plants, in areas with:

1. Turf, replace turf with sod under section 20-3.03C(3)(e).
2. Groundcover, replace groundcover plants from flats and plant at 12 inches on center under section 20-3.03C. No replacement of *Carpobrotus* and *Delosperma* is required if removed by rototilling.

Where existing surfacing is removed, replace the structural section to match the materials removed. Replacement concrete must be of uniform smoothness, color, and texture equal to the adjacent concrete surface. Dispose of removed material.

Install supply line and conduits at the bottom of trenches and backfill with sand to a depth of 2 inches over the top of the supply lines and conduits. Excluding the part of the trench backfilled with surfacing or pavement, the remainder of the trench must be backfilled with material that is excavated from the trench. Rock, broken concrete, asphalt concrete and other particles larger than 2 inches in greatest dimension must not be used.

20-2.01C(3) Pull Boxes

Install pull boxes under section 86-2.06 at the following locations:

1. At all conductor splices except splices made in valve boxes
2. Within 5 feet of irrigation controllers
3. At ends of electrical conduits
4. At other locations shown

20-2.01C(4) Valve Boxes and Covers

Install and identify each valve box as shown.

In walkways and paved areas, install the top of the valve box flush with the surrounding finished grade.

20-2.01C(5) Recycled Water Warning Signs

Install recycled water warning signs on irrigation facilities using recycled water.

Install sign decals directly to clean, smooth surfaces. Clean the surface with alcohol or an equivalent cleaner before applying the decal.

Install a 4 by 4 inch warning sign decal to each:

1. Backflow preventer assembly
2. Irrigation controller enclosure cabinet door

Install a 2 by 2 inch warning tag to the each remote control valve and valve box cover.

Install a 2-1/2 by 3 inches sign decal to each sprinkler riser.

Under local regulations, install a 12 by 12 inch warning sign decal on an aluminum plate and attach to gates, fences, and walls located in the vicinity of a recycled water irrigation system. On gates and fences, install signs with S hooks and C clips or 14-gauge galvanized steel wire. On concrete walls or other rough surfaces, install signs with a silicon-based adhesive.

20-2.01C(6) Garden Valves

Furnish 3 keys for each garden valve before Contract acceptance.

20-2.01D Payment

Not Used

20-2.02 EXISTING IRRIGATION FACILITIES

20-2.02A General

20-2.02A(1) Summary

Section 20-2.02 includes specifications for checking, testing, operating, replacing, and relocating existing irrigation facilities.

20-2.02A(2) Definitions

Reserved

20-2.02A(3) Submittals

Submit a list of irrigation system deficiencies within 7 days after checking the existing facilities.

20-2.02A(4) Quality Control and Assurance

After irrigation facilities have been relocated, demonstrate in the presence of the Engineer that the relocated facilities function properly.

Certify each existing backflow preventer under section 20-2.03A(4).

20-2.02B Materials

Valve box covers must be the same size as the covers they replace.

Control and neutral conductors must be the same size and color as the control and neutral conductors they replace.

20-2.02C Construction

20-2.02C(1) General

Notify the Engineer at least 4 business days before shutting off the water supply to any portion of the existing irrigation system and immediately after restoring the water supply to any portion of the existing irrigation system.

If an irrigation facility to be relocated is determined unsuitable by the Engineer, replace irrigation facility under section 20-2. This work is change order work.

20-2.02C(2) Check and Test Existing Irrigation Facilities

Before performing irrigation system work, check existing irrigation facilities to remain in place or to be relocated. The Engineer determines the test watering cycle lengths. Check for deficiencies including missing parts, damaged components, and improper operation. Correct deficiencies as ordered. The correction of deficiencies is change order work.

20-2.02C(3) Operate Existing Irrigation Facilities

If the Contract includes a bid item for operate existing irrigation facilities, after performing work under section 20-2.02C(2), operate existing irrigation facilities through Contract acceptance.

Operate existing irrigation facilities except for water meters, underground supply lines, control and neutral conductors, and electrical conduits.

Check for proper operation at least once every 30 days. Adjust, repair, or replace existing irrigation facilities within 7 days of finding any deficiency.

Operate irrigation systems using the automatic irrigation controller until Contract acceptance. You may operate irrigation controllers manually during plant replacement, fertilization, weed germination, and repair work.

Program the irrigation controllers for seasonal requirements.

20-2.02C(4) Replace Valve Box Covers

Existing valve box covers shown to be replaced must remain in place until the new covers are ready to be installed.

Dispose of removed valve box covers.

20-2.02C(5) Relocate Backflow Preventer Assemblies

Relocate backflow preventer assembly as shown and install under section 20-2.03C.

20-2.02C(6) Relocate Water Meters

Relocate water meter as shown.

20-2.02C(7) Relocate Irrigation Controllers

Relocate irrigation controller as shown and install under section 20-2.07C.

20-2.02D Payment

Not Used

20-2.03 BACKFLOW PREVENTER ASSEMBLIES

20-2.03A General

20-2.03A(1) Summary

Section 20-2.03 includes specifications for installing a backflow preventer assembly.

20-2.03A(2) Definitions

Reserved

20-2.03A(3) Submittals

Reserved

20-2.03A(4) Quality Control and Assurance

Each backflow preventer assembly must be certified by a backflow preventer tester. The tester must have an active and valid certification from the water purveyor having jurisdiction.

If the local water purveyor does not have a certification program, the tester must be certified by AWWA or a nearby county with a certification program.

Notify the Engineer at least 5 business days before certifying backflow preventer assembly.

Certify each backflow preventer assembly annually and within 10 days before Contract acceptance.

20-2.03B Materials

20-2.03B(1) General

Each backflow preventer assembly must include:

1. Backflow preventer including gate valve, wye strainer, brass or malleable iron unions, fittings, and supports
2. Blanket
3. Enclosure
4. Concrete pad

Concrete for the pad must be minor concrete, except the concrete must not contain less than 463 pounds of cementitious material per cubic yard. Hand mixing of the concrete is allowed.

20-2.03B(2) Backflow Preventers

Each backflow preventer must:

1. Be reduced-pressure principle type.
2. Comply with the requirements of the water purveyor that has jurisdiction.
3. Be factory-assembled with:
   - 3.1. 2 check valves
   - 3.2. 1 pressure differential relief valve
   - 3.3. 4 test cocks
   - 3.4. 2 shut-off valves manufactured from iron or bronze. Shut-off valves must be one of the following:
     - 3.4.1. Resilient wedge gate valves
     - 3.4.2. Resilient seated and fully ported ball valves
     - 3.4.3. Resilient seated butterfly valves

Backflow preventer components must be capable of withstanding a working pressure of 150 psi.

20-2.03B(3) Backflow Preventer Blankets

Each backflow preventer blanket must:

1. Be polyester fabric coated with vinyl or polymeric resin
2. Be resistant to UV light, water, mildew, and fire
3. Have an R-value from R-30 to R-38

Blankets must have a securing mechanism that includes either zippers, hook-pile tape, grommets, snaps, buttons, or any combination of these. Wherever the backflow preventer is not in an enclosure, the securing mechanism must be capable of accepting a padlock.

20-2.03B(4) Backflow Preventer Enclosures

Each backflow preventer enclosure must:

1. Have expanded metal sides, ends, and top panels fabricated from 9-gauge minimum thickness stainless sheet steel with openings of approximately 3/4 by 1-3/4 inches
2. Have expanded metal panels attached to the 3/16-inch thick steel frame by a series of welds not less than 1/4 inch in length and spaced not more than 4 inches on center, along the edges of the enclosure
3. Have Type 304 stainless steel lock guards with a minimum thickness of 12 gauge.
4. Have hexagonal nuts and lock-type washers
5. Be powder coated by the manufacturer to match color no. 20450 of FED-STD-595.
6. Have padlock clasp or latch and lock mechanism

20-2.03C Construction

Finish exposed top surfaces of concrete pad with a medium broom finish applied parallel to the long dimension of pads.

Install hold-downs for the backflow preventer assembly enclosure when concrete is still plastic.

20-2.03D Payment

Not Used

20-2.04 CAM COUPLER ASSEMBLIES

20-2.04A General

Section 20-2.04 includes specifications for installing a cam coupler assembly.

20-2.04B Materials

Each cam coupler assembly must consist of a cam coupler, dust cap, check valve, pipes, fittings, concrete thrust block, and valve box with woven wire cloth and gravel.

Cam couplers and keys must be manufactured of brass or bronze and be able to withstand a working pressure of 150 psi.

Furnish 3 loose cam coupler keys before Contract acceptance.

20-2.04C Construction

Install cam coupler assemblies in valve boxes as shown.

20-2.04D Payment

Not Used

20-2.05 CONTROL AND NEUTRAL CONDUCTORS

20-2.05A General

20-2.05A(1) Summary

Section 20-2.05 includes specifications for installing control and neutral conductors.

20-2.05A(2) Definitions

Reserved

20-2.05A(3) Submittals

Reserved

20-2.05A(4) Quality Control and Assurance

Perform field tests on control and neutral conductors. Field tests must comply with the specifications for lighting circuits in section 86-2.14B.

Where the conductors are installed by trenching and backfilling, perform field tests after a minimum of 6 inches of backfill material has been placed and compacted over the conductors.

20-2.05B Materials

Control and neutral conductors must comply with the requirements in section 86-2.08.

For connections between 24-volt irrigation controllers and valve solenoids, use control and neutral conductors. Conductors must include a control conductor for each valve and a common neutral.

Conductor insulation color, except for the stripes, must be continuous throughout. The color of the conductors must be consistent from the controller to each valve. Neutral conductors must be white. Do not use white for control conductors. Do not use conductors with green insulation except as permitted by the NEC.

Conductors must be:

1. No. 12 AWG or larger or no. 14 AWG or larger for armor-clad
2. Rated for 36 V or 600 V for armor-clad
3. Rated for direct burial
4. Underground feeder cable Type UF and TWU
5. Solid, uncoated copper for armor-clad
6. Not less than 90 percent of the AWG diameter required

No. 10 and smaller conductors must be insulated with a minimum of 56 mils of PVC or a minimum of 41 mils of polyethylene. No. 8 and larger conductors must be insulated with a minimum of 70 mils of PVC.

No. 10 and smaller armor-clad conductors must be insulated with a minimum of 41 mils of polyethylene. No. 8 and larger armor-clad conductors must be insulated with 54 to 60 mils of PVC.

Armor-clad conductors must include:

1. Stainless steel tape armor, Type 304 and helically wrapped with a 33 percent minimum overlap. The tape must be 0.5 inch wide and at least 0.005 inch thick.
2. PVC outer conductor jacket that is UV resistant and complies with the ICEA S-61-402, NEMA standard WC5 and UL listing 1263. The jacket nominal thickness must be 24 to 30 mils thick.

20-2.05C Construction

20-2.05C(1) General

Reserved

20-2.05C(2) In Open Trenches

Do not install control and neutral conductors above each other in an open trench. Wrap conductors together with electrical tape at 5 foot intervals.

Where conductors are installed in the same trench as supply line, install at the same depth as the line. At other locations, install conductors not less than 12 inches below finished grade.

Where conductors are not in a supply line trench, install conductors at least 4 feet from curbs, dikes, and paved shoulders.

20-2.05C(3) In Conduits

Install conductors in electrical conduit if conductors are to be:

1. Surface mounted
2. Installed in or on structures
3. Installed under paved areas
4. Installed in irrigation conduits
5. Placed in concrete

20-2.05C(4) Splicing

Splice low voltage control and neutral conductors under sections 86-2.09C, 86-2.09D, and 86-2.09E, except do not use method B. Tape used for splice insulation must be PVC tape.

Leave at least 2 feet of slack for each conductor at each:

1. Pull box
2. Valve box for each conductor that is connected to other facilities within the box or spliced within the box

Do not splice conductors in irrigation controller cabinets.

Permanent splice connections must be made with freshly cut and skinned conductors. Do not use temporary splices made for testing valve circuits as permanent splices.

20-2.05C(5) Marking

Mark control and neutral conductors in pull boxes, valve boxes, at irrigation control terminals, and at splices.

Mark conductor terminations and splices with adhesive cloth wrap-around markers. Seal markers with clear, heat-shrinkable sleeves.

Mark nonspliced conductors with clip-on C-shaped white extruded PVC sleeves. Sleeves must have black indented legends of uniform depth with transparent overlays over the legends and chevron cuts for the alignment of 2 or more sleeves.

Identify markers for the control conductors with the appropriate irrigation controller and station number.

20-2.05D Payment

Not Used

20-2.06 FLOW SENSORS

20-2.06A General

Section 20-2.06 includes specifications for installing a flow sensor.

20-2.06B Materials

Each flow sensor must be an inline type with a nonmagnetic spinning impeller as the only moving part.

The electronics housing must:

1. Be schedule 80 PVC or cast 85-5-5-5 bronze
2. Include glass-filled polyphenylene sulfide
3. Be easily removable from the meter body and include 2 ethylene-propylene O-rings

The impeller must be tungsten carbide.

The electronics must be rated to withstand prolonged water immersion conditions and include 2 single conductor 18 AWG leads, 48 inches long.

The insulation must be direct burial UF type colored red for the positive lead and black for the negative lead.

The flow sensor must be capable of withstanding:

1. 100 to 400 psi operating pressure depending on sensor size shown
2. Liquid temperatures up to 220 degrees F
3. Flows from 1/2 to 15 ft/sec

20-2.06C Construction

Install flow sensor as shown.

20-2.06D Payment

Not Used

20-2.07 IRRIGATION CONTROLLERS

20-2.07A General

20-2.07A(1) Summary

Section 20-2.07 includes specifications for installing irrigation controllers.

20-2.07A(2) Definitions

irrigation controller: "Smart" irrigation controller as defined by the Irrigation Association.

remote irrigation control system (RICS): Centralized water management system that consists of a base station, centralized server, satellite controllers.

base station: Designated computer located at a Department maintenance facility or District Office that collects data from a series of satellite controllers through a centralized server.

centralized server: Designated server or web-based application that collects data from all base stations.

web-based application: Encrypted managing software that is coded in a browser-supported language and is executable via a common internet web browser (e.g., Microsoft Internet Explorer, Firefox, Safari, etc.).

satellite controller: Irrigation controller that communicates directly to a base station or centralized server.

network communication: Identified means through which satellite controllers, base stations, and a centralized server communicate to one another (i.e., fiber optics, spread spectrum, phone line, etc.).

remote access device: Device (i.e., FCC compliant radio remote, cell phone or wireless, etc.) used to communicate with satellite controllers from a remote location.

20-2.07A(3) Submittals

Submit as an informational submittal, a complete manufacturer's maintenance and operations manual for each type of controller installed. Submit the manual at the time the wiring plans and diagrams are placed inside the controller enclosure or cabinet door.

20-2.07A(4) Quality Control and Assurance

Provide training by a qualified person on the use and adjustment of the irrigation controllers installed 30 days before Contract acceptance.

Modifications to electrical components must be done by the manufacturer before shipment to the job site.

The installation date and expiration date of the manufacturer's guarantee for the controllers must be permanently marked on the inside face of the controller.

20-2.07B Materials

20-2.07B(1) General

Conventional A/C powered irrigation controllers must operate on 110/120 V, 60 Hz(ac) and supply 24 to 30 VAC, 60 Hz(ac) for operating electrical remote control valves.

Concrete for the pad and foundation must be minor concrete, except the concrete must not contain less than 463 pounds of cementitious material per cubic yard. Hand mixing of the concrete is allowed.

20-2.07B(2) Irrigation Controllers

20-2.07B(2)(a) General

The irrigation controllers must:

1. Be A/C, battery, solar, or 2-wire as shown
2. Be from a single manufacturer.
3. Be fully automatic and capable of operating a complete 30-day or longer irrigation program.
4. Have a switch or button on the face of the irrigation control panel showing that the irrigation controller can be turned on or off and provide for automatic or manual operation. Manual operation must allow cycle start at the desired station and allow for the minimum activation of a single station or have the option to operate multiple stations in sequential or simultaneous operation modes.
5. Have non-volatile memory.
6. Have a watering time display on the face of the control panel.
7. Have a panel and circuit board connected to the low voltage control and neutral conductors by means of a plug and receptacle connectors located within the cabinet enclosure.
8. Have a variable or incremental timing adjustment ranging from 1 minute to 360 minutes per station.
9. Be capable of operating at least 3 program schedules.
10. Be capable of having at least 4 start times per program schedule.
11. Have an output that can energize a pump start circuit or a remote control master valve.
12. Be protected by fuses and circuit breakers.
13. Display a program and station affected by a sensory alert without altering other watering schedules not affected by the alert.
14. Be capable of global manual and automatic seasonal adjustments to all valves in any given program.
15. Automatically alter watering schedule in accordance with evapotranspiration data provided by a local weather station or have an internal programmed default of historical evapotranspirational data for a given region.
16. Support a flow sensor, rain sensor, or weather station and have automatic shut-off capability.
17. Be capable of communicating with the remote access device.

If the irrigation controller is installed in an enclosure cabinet, the cabinet must be stainless steel and must comply with section 86-3.04A.

Irrigation controllers not installed in enclosure cabinets must be weatherproof, constructed of fiberglass or metal and have a door lock with 2 keys provided.

RICS must meet the requirements of an irrigation controller and be capable of being accessible only through a secured and encrypted server that is password and firewall protected by the Department or be accessible through a firewall secure remote server that is independent from any Department servers. The Department will set up and manage the network communication.

20-2.07B(2)(b) Battery Powered Irrigation Controllers

Reserved

20-2.07B(2)(c) Solar Powered Irrigation Controllers

Reserved

20-2.07B(2)(d) Two-wire Irrigation Controllers

Reserved

20-2.07B(3) Irrigation Controller Enclosure Cabinets

The irrigation controller enclosure cabinet must:

1. Be stainless steel.
2. Include a mounting panel. Fabricate mounting panels with one of the following:
   - 2.1. 3/4-inch exterior AC grade veneer plywood. Paint panels with 1 application of an exterior, latex based, wood primer and 2 applications of an exterior, vinyl acrylic enamel, white in color. Paint panels on all sides and edges before installation of the panels in the cabinets and the equipment on the panels.
   - 2.2. 3/16-inch thick aluminum sheets.
   - 2.3. 10-gauge cold-rolled steel sheets.
   - 2.4. 0.157-inch stainless steel metal sheets.
3. Provide cross ventilation, roof ventilation, or a combination of both. Ventilation must not compromise the weather resistance properties of the cabinet and must be fabricated by the cabinet manufacturer.
4. Include protection against lightning damage.
5. Have an area inside the cabinet doors for storage of the as-built schematic wiring diagram and irrigation plans.
6. Have padlock clasp or latch and lock mechanism.

20-2.07B(4) Rain Sensors

A rain sensor unit must be a solid state, automatic shut-off type, and compatible with the irrigation controller. The rain sensor unit must automatically interrupt the master remote control valves when approximately 1/8 inch of rain has fallen. The irrigation controller must automatically be enabled again when the accumulated rainfall evaporates from the rain sensor unit collection cup.

Rain sensor units must be one of the following:

1. Rated 24 V(ac) to 30 V(ac)
2. Wireless and FCC compliant

20-2.07C Construction

Finish exposed top surface of concrete pad with a medium broom finish applied parallel to the long dimension.

Locate irrigation controllers in pedestal or wall mounted enclosures as shown.

Install electrical components for automatic irrigation systems under section 86-1.02.

Install irrigation controllers under the manufacturer's instructions and as shown.

If 2 or more irrigation controllers operate the same remote master control valve, furnish and install an isolation relay under the controller manufacturer's instructions.

Where direct burial conductors are to be connected to the terminal strip, connect the conductors with the open-end-crimp-on wire terminals. Exposed wire must not extend beyond the crimp of the terminal and the wires must be parallel on the terminal strip.

Install rain sensor units for irrigation controllers on the irrigation controller enclosure cabinets. Provide protection against lightning damage.

20-2.07D Payment

Payment for electrical service for 120-volt or higher is not included in the payment for irrigation controller.

20-2.08 IRRIGATION CONDUIT

20-2.08A General

20-2.08A(1) Summary

Section 20-2.08 includes specifications for installing irrigation conduit under a roadway or other facility to accommodate electrical conduit for control and neutral conductors and irrigation supply lines.

Before performing work on irrigation systems, locate existing conduits shown to be incorporated into the new work.

Before removing or disturbing existing Type A pavement markers that show the location of the existing conduit, mark the location of the existing conduit on the pavement.

20-2.08A(2) Definitions

Reserved

20-2.08A(3) Submittals

Reserved

20-2.08A(4) Quality Control and Assurance

Demonstrate the conduits are free of obstructions after placement of base and surfacing.

Before and after extending the irrigation supply line in a conduit, pressure test the supply line under section 20-2.01A(4)(b).

After conductors are installed in a conduit, test the conductors under section 20-2.05A(4).

Assign a technical representative to direct and control the directional bore activities. The representative must be present during directional bore activities. Unless otherwise authorized, perform directional bore activities in the presence of the Engineer.

20-2.08B Materials

20-2.08B(1) General

Reserved

20-2.08B(2) ABS Composite Pipe Conduit

ABS composite pipe and couplings must comply with ASTM D 2680. Couplings must be solvent cement type.

20-2.08B(3) Corrugated High Density Polyethylene Pipe Conduit

Corrugated high density polyethylene pipe must comply with ASTM F 405 and F 667 or be Type S and comply with AASHTO M252 and M294. Couplings and fittings must be as recommended by the pipe manufacturer.

20-2.08B(4) Corrugated Steel Pipe Conduit

Corrugated steel pipe conduit must comply with section 66. The nominal thickness of metal sheets for pipe must be 0.064 inch for corrugated steel pipe and 0.060 inch for corrugated aluminum pipe. Coupling bands and hardware must comply with section 66.

20-2.08B(5) Polyvinyl Chloride Pipe Conduit

PVC pipe conduit must be schedule 40 and comply with ASTM D 1785.

Fittings must be schedule 80.

20-2.08B(6) Welded Steel Pipe Conduit

Welded steel pipe must comply with ASTM A 53. Pipe must be black and have either welded or threaded joints.

The minimum wall thickness for the various sizes of welded steel pipe must comply with the dimensions shown in the following table:

Pipe size, nominal (inch)	Minimum wall thickness (inch)
3	0.216
4	0.237
6	0.280
8	0.277
10	0.279
12	0.330

20-2.08C Construction

20-2.08C(1) General

When existing conduits are to be incorporated in new work, excavate exploratory holes for locating existing conduits at the locations indicated by existing markers or as directed. Excavate and backfill exploratory holes to a maximum size of 2-1/2 feet in width, 5 feet in depth, and 5 feet on each side of the marker or directed location parallel to the roadway. If the conduit is not found and if ordered, increase the size of the exploratory holes beyond the dimensions specified. The additional excavation and backfill is change order work.

If extending an existing conduit, remove conductors from the conduit.

Use a coupling band if the new conduit matches the existing conduit diameter, otherwise overlap the conduit at least 12 inches.

After extending existing conduits, install conductors that match the color and size of the existing conductors without splices. Splice conductors in adjacent pull boxes.

If installing a control and neutral conductor and electrical conduit through the irrigation conduit, install a no. 5 pull box at each end.

Remove debris found in the conduit before performing other work. Debris found more than 3 feet from the ends of the conduits is removed as change order work.

Extend conduit 2 feet beyond all paving unless otherwise shown.

Cap the ends of unused conduit.

Designate the location of each conduit by cementing a Type A pavement marker as shown. Type A pavement markers and adhesive must comply with section 85.

20-2.08C(2) Welded Steel Pipe Conduit

20-2.08C(2)(a) General

Install welded steel pipe by directional boring or jack and drill.

Install top of conduits:

1. 18 to 30 inches below the finished surface in sidewalk areas
2. 40 to 52 inches below the finished grade in other paved areas

20-2.08C(2)(b) Directional Boring

Notify the Engineer 2 business days before starting directional bore activities.

The diameter of the boring tool for directional boring must be only as large as necessary to install the conduit.

Mineral slurry or wetting solution may be used to lubricate the boring tool and to stabilize the soil surrounding the boring path. The mineral slurry or wetting solution must be water based.

The directional bore equipment must have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the directional bore equipment must be able to determine the location of the tool both horizontally and vertically.

20-2.08C(2)(c) Jack and Drill

Notify the Engineer 2 business days before starting jack and drill activities.

Jacking or drilling pits must be no closer than 2 feet from pavement edge whenever possible.

If authorized, small holes may be cut in the pavement to locate or remove obstructions.

Do not use excessive water that will soften subgrade or undermine pavement.

20-2.08C(3) Schedule 40 Pipe Conduit

Where schedule 40 pipe conduit 2 inches or less in outside diameter is installed under surfacing, you may install by directional boring under section 20-2.08C(2)(b).

For conduit 2 inches or less in diameter, the top of the conduit must be a minimum of 18 inches below surfacing.

Extend schedule 40 pipe conduit 6 inches beyond surfacing. Cap ends of conduit until used.

20-2.08D Payment

Schedule 40 PVC pipe conduit is paid for as plastic pipe (schedule 40) (supply line).

20-2.09 IRRIGATION SUPPLY LINE

20-2.09A General

20-2.09A(1) Summary

Section 20-2.09 includes specifications for installing irrigation supply line.

If the supply line location interferes with the excavation of plant holes, relocate the plant hole to clear the supply line. Do not install supply lines through plant holes unless shown.

Supply lines, control and neutral conductors and electrical conduits installed in common trenches must not be installed above each other.

20-2.09A(2) Definitions

Reserved

20-2.09A(3) Submittals

Submit a certificate of compliance for polyethylene pipe and plastic pipe supply line.

20-2.09A(4) Quality Control and Assurance

Solvent cement must comply with the local Air Quality Management District requirements.

20-2.09B Materials

20-2.09B(1) General

Irrigation supply pipe must be metal or plastic as shown.

PCC for thrust blocks must be produced from commercial-quality aggregates. The concrete must contain at least 295 pounds of cementitious material per cubic yard.

20-2.09B(2) Copper Pipe Supply Line

Copper pipe must be Type K rigid pipe and comply with ASTM B 88. Fittings must be wrought copper or cast bronze either soldered or threaded.

Solder must be 95 percent tin and 5 percent antimony.

20-2.09B(3) Galvanized Steel Pipe Supply Line

Galvanized steel pipe supply line and couplings must be standard weight and comply with ASTM A 53, except that the zinc coating must not be less than 90 percent of the specified amount. Except for couplings, fittings must be galvanized malleable iron, banded and threaded, and comply with ANSI B16.3, Class 150.

Joint compound must be nonhardening and noncorrosive. Do not use pipe thread sealant tape.

20-2.09B(4) Drip Irrigation Tubing

Drip irrigation tubing must be virgin polyethylene plastic and comply with ASTM D 2737.

The drip irrigation tubing must be distribution tubing with preinstalled in-line emitters.

If preinstalled in-line drip irrigation tubing is not shown, you may install emitters that match the distribution requirements shown. The emitters must be barbed or threaded-type outlet devices with dual silicone diaphragms and installed under the manufacturer's instructions.

The emitters must meet the flow rate and operating pressure range shown.

The wall thickness of polyethylene tubing must comply with the following requirements when tested under ASTM D 2122:

Pipe size, nominal (inch)	Minimum wall thickness (inch)	Maximum wall thickness (inch)
1/2	0.050	0.070
5/8	0.055	0.075
3/4	0.060	0.080

The polyethylene tubing fittings must be leak-free, compression type and have female sockets with an internal barb to provide a positive pipe-to-fitting connection that will not separate at the designed pressure.

20-2.09B(5) Plastic Pipe Supply Line

Plastic pipe supply line must be PVC pipe that is NSF approved.

Schedule 40 plastic pipe supply line must comply with ASTM D 1785.

Class 315 plastic pipe supply line must comply with ASTM D 2241.

PVC gasketed bell joints must comply with ASTM D 2672, ASTM D2241, ASTM D 3139, and ASTM F 477.

For solvent-cemented type joints, the primer and solvent cement must be made by the same manufacturer. The primer color must contrast with the color of the pipe and fittings.

Solvent-cemented fittings must be injection molded PVC, schedule 40, and comply with ASTM D 2466.

Fittings for supply line placed in irrigation conduit must be schedule 80.

Fittings for plastic pipe supply line larger than 4 inches must be ductile iron under section 20-2.14C(2)(b).

If UV-resistant plastic pipe supply line is required, the pipe must be homogeneous, uniform color and be manufactured of:

1. At least 80 percent vinyl chloride resin with UV stabilizers
2. Non-PVC resin modifiers and coloring ingredients
3. Coloring ingredients with UV stabilizers

20-2.09C Construction

20-2.09C(1) General

Cut pipe straight and true. After cutting, ream out the ends to the full inside diameter of the pipe.

Prevent foreign material from entering the irrigation system during installation. Immediately before assembling, clean all pipes, valves, and fittings. Flush lines before attaching sprinklers, emitters, and other terminal fittings.

Pipe supply lines installed between the water meter and backflow preventer assembly must be installed not less than 18 inches below finished grade measured to the top of the pipe.

Where a connection is made to existing supply lines, bell and gasketed fittings or compression fittings may be used.

Install a thrust block at each change in direction on the main supply line, terminus run, and at other locations shown.

Where supply lines cross paved ditches more than 3 feet deep at their flow line, install galvanized steel pipe for the entire span of the ditch.

Secure UV resistant plastic pipe supply line on grade as shown.

20-2.09C(2) Galvanized Steel Pipe Supply Line

Coat male pipe threads on galvanized steel pipe according to the manufacturer's instructions.

20-2.09C(3) Drip Irrigation Tubing

Install drip irrigation tubing on grade and under manufacturer's instructions.

Install a flush valve and an air-relief valve if recommended by the drip valve assembly manufacturer.

20-2.09C(4) Plastic Pipe Supply Line

For PVC pipe 1-1/2 inches in diameter or smaller, cut the pipe with PVC cutters.

For solvent-cemented type joints, apply primer and solvent-cement separately under the manufacturer's instructions.

Wrap the male portion of each threaded plastic pipe fitting with at least 2 layers of pipe thread sealant tape.

Install plastic pipe supply line mains with solvent-cemented type joints not less than 18 inches below finished grade measured to the top of the pipe.

Install plastic pipe supply line laterals with solvent-cemented type joints not less than 12 inches below finished grade measured to the top of the pipe.

Snake plastic pipe installed by trenching and backfilling methods.

20-2.09D Payment

Supply line pipe and drip irrigation tubing are measured along the slope.

20-2.10 SPRINKLER ASSEMBLIES

20-2.10A General

Section 20-2.10 includes specifications for installing sprinkler assemblies.

20-2.10B Materials

20-2.10B(1) General

Each sprinkler assembly must meet the characteristics shown in the irrigation legend.

Where shown, a sprinkler assembly must have a flow shut-off device that automatically stops the flow of water on the downstream side of the device when the assembly is broken. You may use a sprinkler assembly with a preinstalled flow shut-off device or you must install a flow shut-off device under the manufacturer's instructions.

Flexible hose for sprinkler assembly must be leak-free, nonrigid and comply with ASTM D 2287, cell Type 6564500. The hose wall thickness must comply with ASTM D 2122 for the hose diameters shown in the following table:

Hose diameter, nominal (inch)	Minimum wall thickness (inch)
1/2	0.127
3/4	0.154
1	0.179

Solvent cement and fittings for flexible hose must comply with section 20-2.09B(5).

20-2.10B(2) Pop-Up Sprinkler Assemblies

Each pop-up sprinkler assembly must include a body, nozzle, swing joint, pressure compensation device, check valve, sprinkler protector, and fittings as shown.

20-2.10B(3) Riser Sprinkler Assemblies

Each riser sprinkler assembly must include a riser or flexible hose, threaded nipple, check valve, and nozzle as shown. The riser must be UV resistant schedule 80, PVC 1120 or PVC 1220 pipe and comply with ASTM D 1785.

20-2.10B(4) Tree Well Sprinkler Assemblies

Each tree well sprinkler assembly must include a body, riser, riser support, perforated drainpipe, and drain cap.

The perforated drainpipe must be commercial grade, rigid, PVC pipe with holes spaced not more than 6 inches on center on 1 side of the pipe.

Drain cap must be commercially available, 1 piece, injection molded drain grate manufactured from structural foam polyolefins with UV light inhibitors. Drain grate must be black.

Gravel for filling the drainpipe must be graded such that 100 percent passes the 3/4-inch sieve and 100 percent is retained on the 1/2-inch sieve. Gravel must be clean, washed, dry, and free from clay or organic material.

20-2.10C Construction

Install pop-up and riser sprinkler assembly:

1. 6-1/2 to 8 feet from curbs, dikes, and sidewalks
2. 10 feet from paved shoulders
3. 3 feet from fences and walls

If sprinkler assembly cannot be installed within these limits, the location will be determined by the Engineer.

Set sprinkler assembly riser on slopes perpendicular to the plane of the slope.

Install tree well sprinkler assembly as shown.

20-2.10D Payment

Not Used

20-2.11 VALVES

20-2.11A General

Section 20-2.11 includes specifications for installing valves.

20-2.11B Materials

20-2.11B(1) General

Valves must:

1. Include a valve box and cover
2. Be the same size as the supply line that the valve serves unless otherwise shown
3. Be bottom, angled, or straight inlet configuration

20-2.11B(2) Ball Valves

Ball valve must be a two-piece brass or bronze body and comply with the requirements shown in the following table:

Property	Requirements
Nonshock working pressure, min	400 psi
Seats	PTFE
O-ring seals	PTFE

Ball valve must be the same size as the supply line that the valve serves.

20-2.11B(3) Check Valves

Each check valve must:

1. Be schedule 80 PVC and factory set to 5 psi for adjustable spring check valve
2. Be Class 200 PVC for swing check valves on non pressurized plastic irrigation supply line

20-2.11B(4) Drip Valve Assemblies

Each drip valve assembly must include:

1. Remote control valve
2. Wye filter with:
    - 2.1. Filter housing that:
        - 2.1.1. Can withstand a working pressure of 150 psi
        - 2.1.2. Is manufactured of reinforced polypropylene plastic
    - 2.2. Reusable stainless steel filter cartridge with a 200 mesh size filtration
3. Ball valve under 20-2.11B(2)
4. Schedule 80 PVC pipes and fittings
5. Pressure regulator

20-2.11B(5) Garden Valve Assemblies

Each garden valve assembly must have:

1. Garden valve
2. Location marker

20-2.11B(6) Gate Valves

Gate valves must be:

1. Flanged or threaded type
2. Iron or bronze body
3. Bronze trimmed with one of the following:
    - 3.1. Internally threading rising stem
    - 3.2. Nonrising stem
4. Able to withstand a working pressure of 150 psi
5. Same size as the pipeline that the valves serves unless otherwise shown

Gate valves smaller than 3 inches must have a cross handle.

Gate valves 3 inches or larger must be flanged type with a square nut. Furnish 3 long shank keys before Contract acceptance.

Gate valves attached to the outlets of a wye strainer must have seating rings on the discharge side of the gate valves must be PTFE. Valve wedges must be driven obliquely by cam action into the seating rings.

20-2.11B(7) Pressure Regulating Valves

Pressure regulating valve must be:

1. Flanged or threaded type
2. Brass, bronze, cast iron, or plastic body

3. Spring diaphragm type
4. Pilot controlled

Pressure regulating valve must have no internal filter screens.

20-2.11B(8) Pressure Relief Valves

Pressure relief valve must have a brass or bronze body, stainless steel springs, bronze nickel chrome seats, composition seat discs, female bottom inlets, and female side outlets.

20-2.11B(9) Quick Coupling Valves

Quick coupling valve must be 3/4 inch double slotted with a self-closing cap, 3/4-inch brass key and 3/4-inch brass hose swivel unless otherwise shown. Except for the cap, quick coupling valve must be brass or bronze construction. Furnish 3 loose quick coupling brass keys and brass hose swivels before Contract acceptance.

20-2.11B(10) Remote Control Valves

20-2.11B(10)(a) General

Each remote control valve must:

1. Be normally closed type.
2. Be glass filled nylon, brass, or bronze.
3. Be completely serviceable from the top without removing the valve body from the system.
4. Be equipped with a device that regulates and adjusts the flow of water and be provided with a manual shut-off. The manual shut-off for valves larger than 3/4 inch must be operated by a cross handle.
5. Have solenoids compatible with the irrigation controller.
6. Have a manual bleed device.
7. Be capable of withstanding a pressure of 200 psi
8. Have replaceable compression discs or diaphragms.
9. Have threaded fittings for inlets and outlets.
10. Have DC latching solenoids when used with solar or battery controllers. Solenoids must operate on 3.5 V.

20-2.11B(10)(b) Remote Control Valves with Flow Sensor

Reserved

20-2.11B(10)(c) Remote Control Valves with Pressure Regulator

Each remote control valve with pressure regulator must be factory assembled as 1 unit.

20-2.11B(11) Wye Strainer Assemblies

Each wye strainer assembly must include:

1. Wye strainer
2. Garden valve

20-2.11C Construction

20-2.11C(1) General

Install control valves:

1. 6-1/2 to 8 feet from curbs, dikes, and sidewalks
2. 10 feet from paved shoulders
3. 3 feet from fences, walls, or both

If a control valve cannot be installed within these limits, the location will be determined by the Engineer.

20-2.11C(2) Check Valves

Unless otherwise shown, install spring-action check valves as necessary to prevent low head drainage.

20-2.11C(3) Garden Valve Assemblies

Install a location marker 8 to 10 inches from the back of each garden valve.

20-2.11C(4) Pressure Regulating Valves

Install pressure regulating valves with threaded connections and a union on the inlet side of the valves.

20-2.11C(5) Wye Strainer Assemblies

Unless shown, install wye strainer assembly on the upstream side of the remote control valves.

Install garden valve so that when the system is flushed, the discharge sprays out of the valve box.

20-2.11D Payment

Not Used

20-2.12 WATER METERS

Reserved

20-2.13 RESERVED

20-2.14 SUPPLY LINE ON STRUCTURES

20-2.14A General

20-2.14A(1) General

20-2.14A(1)(a) Summary

Section 20-14 includes specifications for installing water supply lines through bridges and on the exterior of concrete structures.

20-2.14A(1)(b) Definitions

Reserved

20-2.14A(1)(c) Submittals

Submit a work plan for temporary casing support at the abutments as an informational submittal.

20-2.14A(1)(d) Quality Control and Assurance

20-2.14A(1)(d)(i) General

Before installing seismic expansion assemblies or expansion assemblies, the Engineer must authorize the extension setting.

20-2.14A(1)(d)(ii) Regulatory Requirements

Piping materials must bear the label, stamp, or other markings of the specified standards.

20-2.14A(1)(d)(iii) Site Tests

Test water supply lines before:

1. Backfilling
2. Beginning work on box girder cell decks
3. Otherwise covering the water supply lines

Furnish pipe anchorages to resist thrust forces occurring during testing.

Test the water supply lines as 1 unit. The limits of the unit must be 5 feet beyond the casing at each end of the bridge.

Cap each end of the water supply lines before testing. Caps must be rated for the test pressure.

Test water supply lines under section 20-2.01A(4)(b), except that the testing period must be 4 hours with no pressure drop.

For water supply lines 4 inches and larger testing must meet the following additional requirements:

1. Testing pressure must be at least 120 psi
2. Air relief valve must not be subjected to water pressure due to testing

If water supply lines fail testing, retest the lines after repair.

20-2.14A(2) Materials

20-2.14A(2)(a) General

Protect stored piping from moisture and dirt. Elevate piping above grade. Support piping to prevent sagging and bending.

Protect flanges, fittings, and assemblies from moisture and dirt.

20-2.14A(2)(b) Air Release Valve Assemblies

Air release valve assemblies include an air release valve, ball valve, tank vent, nipples, and pipe saddle. Assemblies must comply with the following:

1. Air release valves must have a cast iron body with stainless steel trim and float, 1-inch NPT inlet, 1/2-inch NPT outlet, and 3/16-inch orifice.
2. Ball valves must have a 2-piece bronze body with chrome plated or brass ball, 1-inch full-size port, and be rated for at least 400 psi.
3. Tank vents must have a 1/2-inch NPT inlet and downward-facing double openings with screened covers.
4. Nipples must be schedule 40 galvanized steel pipe.
5. Pipe saddle must be rated for at least 150 psi and compatible with water supply line. Pipe saddle must be (1) single strap pipe saddle for water supply lines smaller than 4 inches or (2) double strap pipe saddle for water supply lines 4 inches and larger. You may use a tee fitting for galvanized steel water supply lines.

20-2.14A(2)(c) Casings

Casings must be welded steel pipe casing complying with section 70-7.

20-2.14A(2)(d) Pipe Wrap Tape

Pipe wrap tape must be pressure sensitive tape made from PVC or polyethylene. Pipe wrap tape must be at least 50 mils thick and not wider than 2 inches.

20-2.14A(2)(e) Pipe Hangers

Pipe hangers must comply with section 70-7.02C.

The pipe hanger must be rated for the water supply line. If casings are shown, include the casings weight.

20-2.14A(2)(f) Epoxy Adhesives

Epoxy used for anchoring concrete pipe supports must comply with section 70-7.02D.

20-2.14A(2)(g) Concrete Pipe Supports

Concrete pipe supports must comply with section 70-7.02D.

20-2.14A(2)(h) Pipe Clamps and Anchors

Metal clamps must be commercial quality steel complying with section 75-1.02. Anchors must comply with the specifications for concrete anchorage devices in section 75-1.03C.

20-2.14A(2)(i) Pull Boxes

Pull boxes and covers must comply with section 20-2.01B(5).

20.2.14A(3) Construction

20-2.14A(3)(a) General

Support water supply lines as described.

Where water supply lines penetrate bridge superstructure concrete, either form or install pipe sleeves at least 2 pipe sizes larger than the pipe.

20-2.14A(3)(b) Preparation

Clean the interior of the pipe before installation. Cap or plug openings as pipe is installed to prevent the entrance of foreign material. Leave caps or plugs in place until the next pipe section is installed.

20-2.14A(3)(c) Installation

20-2.14A(3)(c)(i) General

Reserved

20-2.14A(3)(c)(ii) Casings

Install casings under section 70-7.03.

Seal casing end with 8 inches of polyurethane foam at dirt stop or pipe end seal.

20-2.14A(3)(c)(iii) Wrapping Water Supply Line

Wrap damaged supply line coatings with pipe wrap tape. Wrap field joints and fittings that are in contact with the earth.

Wrapping must comply with the following:

1. Clean and prime area as recommended by the tape manufacturer.
2. Tightly wrap tape with 1/2 uniform overlap, free from wrinkles and voids, to provide not less than a 100 mil thickness.
3. The tape must conform to joint or fitting contours.
4. Extend tape at least 6 inches over adjacent pipe.

20-2.14A(3)(c)(iv) Pipe Clamps and Anchors

Install water supply lines on the exterior surfaces of bridges or other concrete structures with metal clamps and anchors.

Drilling of holes for anchors must comply with the following:

1. Drill holes to manufacturers recommended depth.
2. Drilling tools must be authorized.
3. Do not drill holes closer than 6 inches to the edge of a concrete structure.
4. Relocate holes if reinforcing steel is encountered. Fill abandoned holes with mortar. Mortar must comply with section 51-1.02F.

Where water supply lines are mounted vertically for more than 2 feet, install clamps and anchors within 6 inches of the elbows.

Where water supply lines are mounted vertically for more than 10 feet, install additional clamps and anchors at 10 foot centers unless otherwise shown.

20-2.14A(3)(d) Sequences of Operation

If the bridge superstructure is to be prestressed do not place mortar around casings in abutments and hinges until bridge superstructure prestressing has been completed.

20-2.14A(4) Payment

Supply line on structures is measured from end to end, along the centerline.

The Department does not pay for failed tests.

20-2.14B Supply Line on Structures, Less than 4 Inches

20-2.14B(1) General

20-2.14B(1)(a) Summary

Section 20-2.14B includes specifications for installing water supply lines smaller than 4 inches.

20-2.14B(1)(b) Definitions

Reserved

20-2.14B(1)(c) Submittals

Product data for materials includes catalog cuts, performance data, and installation instructions.

Submit product data for:

1. Water supply line
2. Expansion assemblies
3. Casing insulators
4. Pipe end seals
5. Pipe anchorages
6. Air release valve assemblies
7. Casings
8. Pipe hangers
9. Epoxy adhesives
10. Concrete pipe supports

20-2.14B(1)(d) Quality Control and Assurance

Reserved

20-2.14B(2) Materials

20-2.14B(2)(a) General

Reserved

20-2.14B(2)(b) Water Supply Line

Water supply lines must comply with section 20-2.09.

20-2.14B(2)(c) Expansion Assemblies

Expansion assemblies must consist of a hose with ends, insulated flange connections, and elbows. Expansion assemblies must have the same nominal inside diameter as the water supply line. Working pressure must be at least 150 psi.

Hose must be medium or heavy weight, crush and kink resistant, rated for at least 150 psi. Cover must be flexible, oil resistant rubber or synthetic, reinforced with at least 2-ply synthetic yarn or steel wire. The inner tube must meet FDA and USDA Standards for potable water. Hose ends must be stainless steel flanged connections with stainless steel crimped bands or swaged end connectors. Do not use barbed ends with band clamps.

Elbows must be 45 degree, standard weight galvanized steel fittings.

20-2.14B(2)(d) Casing Insulators

Casing insulators must be:

1. 2-piece, high-density, injection-molded polyethylene, nonconductive inner liner, with cadmium-plated nuts and bolts.
2. Factory constructed to ensure the water supply line is centered in the casing. Insulators must not allow any contact between pipe and casing and have at least 2 runners seated on the bottom of the casing.
3. Sized for the casing and water supply line shown.

20-2.14B(2)(e) Pipe Anchorages

Pipe anchorages must consist of an I-beam, U-bolts, anchors, and double nuts.

Use concrete anchorage devices for anchors on existing bridges. Use L-anchor bolts for anchors on new bridges.

Fabricate the I-beam from 1/2-inch steel plate. Steel plate, U-bolts, L-anchors, and nuts must comply with section 75-1.02. Concrete anchorage devices must comply with section 75-1.03C.

20-2.14B(2)(f) Pipe End Seals

Pipe end seals must consist of a pipe end seal, stainless steel bands, and polyurethane foam.

Pipe end seal must be factory constructed from seamless neoprene and sized for the casing and water supply line shown. Neoprene must be at least 1/8 inch thick. Stainless steel bands must be crimped.

Polyurethane foam must be expanding foam spray that is water resistant and moisture cured.

20-2.14B(3) Construction

Locate pipe anchorage halfway between expansion assemblies.

Pipe end seal must be pulled onto the casing during pipe installation. Do not use wrap-around type end seals.

20-2.14B(4) Payment

Supply line on structures is paid for as galvanized steel pipe (supply line on bridge).

20-2.14C Supply Line on Structures, 4 Inches and Larger

20-2.14C(1) General

20-2.14C(1)(a) Summary

Section 20-2.14C includes specifications for installing water supply lines 4 inches and larger.

20-2.14C(1)(b) Definitions

Reserved

20-2.14C(1)(c) Submittals

Product data for materials includes catalog cuts, performance data, and installation instructions.

Submit product data for:

1. Water supply line
2. Expansion assemblies
3. Flange insulating gaskets
4. Casing insulators
5. Seismic expansion assemblies
6. Lateral restraint assemblies
7. Air release valve assemblies
8. Casings
9. Pipe hangers
10. Epoxy adhesives
11. Concrete pipe supports

Submit the maximum range and preset dimension for each expansion assembly or seismic expansion assembly as an informational submittal.

Submit at least 5 sets of product data to OSD, Documents Unit. Each set must be bound together and include an index stating equipment names, manufacturers, and model numbers. Two sets will be returned. Notify the Engineer of the submittal. Include in the notification the date and contents of the submittal.

20-2.14C(1)(d) Quality Control and Assurance

Reserved

20-2.14C(2) Materials

20-2.14C(2)(a) General

Reserved

20-2.14C(2)(b) Water Supply Line

Water supply lines must consist of ductile iron pipe and fittings. Pipe must comply with ANSI/AWWA C151/A21.51, Class 350. Fittings must comply with ANSI/AWWA C110/A21.10, rated for a working pressure of 350 psi.

Ductile iron pipe connections to expansion assemblies must be a flanged joint complying with ANSI/AWWA C115/A21.15. Flange gaskets must be rated for a working pressure of 350 psi. Fasteners must comply with section 75-1.02, except that stainless steel fasteners must not be used.

All other ductile iron pipe and fitting joints must be push-on, restrained type complying with ANSI/AWWA C111/A21.11. Push-on, restrained type joints may use proprietary dimensions and proprietary restrained joint locking systems.

Ductile iron pipe and fittings must have an asphaltic coating complying with ANSI/AWWA C151/A21.51, and a cement mortar lining complying with ANSI/AWWA C104/A21.4.

20-2.14C(2)(c) Expansion Assemblies

Expansion assemblies must be a sleeve type expansion joint. The expansion assembly must have:

1. Ductile iron body complying with ANSI/AWWA C153/A21.53
2. Flanged ends complying with ANSI/AWWA C110/A21.10
3. Fusion bonded epoxy internal lining complying with ANSI/AWWA C213 at least 15 mils thick
4. Internal expansion sleeve limiting stop collars and be pressure balanced
5. Working pressure of at least 350 psi for sizes 24 inches and smaller and 250 psi for sizes larger than 24 inches
6. NSF 61 certification

The expansion assembly must be factory set at 1/2 the extension capacity.

20-2.14C(2)(d) Flange Insulating Gaskets

Flange insulating gaskets must consist of a dielectric flange gasket, insulating washers and sleeves, and commercial quality steel bolts and nuts. Dielectric flange gasket must have a dielectric strength of at least 500 vpm.

20-2.14C(2)(e) Casing Insulators

Casing insulators must be:

1. 2-piece, 8-inch, 14-gauge epoxy-coated or galvanized steel band, four 2-inch-wide glass-reinforced polyester or polyethylene runners, with cadmium-plated nuts and bolts.
2. Coated with at least 15-mils heat-fused PVC to provide a nonconductive inner liner.
3. Factory constructed to ensure the water supply line is centered in the casing. Insulators must not allow any pipe to casing contact and have at least 2 runners seated on the bottom of the casing.
4. Sized for the casing and water supply line shown.

20-2.14C(2)(f) Dirt Stops

Dirt stops must consist of a redwood cover with polyurethane foam.

Use construction heart grade redwood complying with 57-2.01B(2). Construct cover to fit snugly around the water supply line. The cover must be 2 inches taller and 2 inches wider than the casing.

Polyurethane foam must be expanding foam spray that is water resistant and moisture cured.

20-2.14C(2)(g) Seismic Expansion Assemblies

Seismic expansion assemblies must be a sleeve type expansion joint with integral ball joints at each end.

Seismic expansion assemblies must have:

1. Ability to withstand at least 15 degree angular deflection at each end and maximum movement in all 3 planes at the same time
2. Ductile iron body complying with ANSI/AWWA C153/A21.53
3. Flanged ends complying with ANSI/AWWA C110/A21.10
4. Fusion bonded epoxy internal lining complying with ANSI/AWWA C213 at least 15 mils thick
5. Internal expansion sleeve limiting stop collars and pressure balanced
6. Ball joints contained in flanged retainers with seal gaskets
7. Working pressure of at least 350 psi for sizes 24 inches and smaller and 250 psi for sizes larger than 24 inches
8. NSF 61 certification

The seismic expansion assembly must be factory set at 1/2 the extension capacity.

20-2.14C(2)(h) Lateral Restraint Assemblies

Lateral restraint assemblies must be (1) constructed from commercial quality steel components complying with section 75-1.02, (2) adjustable, and (3) able to resist a horizontal force of 10 percent of the contributory dead load.

20-2.14C(3) Construction

Each ductile iron pipe must be connected and fully extended (pulled out) after joint assembly before the next pipe section is added.

Install flange insulating gaskets on the outside flange of seismic expansion assemblies and expansion assemblies.

20-2.14C(4) Payment

Supply line on structures is paid for as supply line (bridge).

20-2.15 TEMPORARY IRRIGATION SYSTEMS

Reserved

20-2.16–20-2.19 RESERVED

20-3 PLANTING

20-3.01 GENERAL

20-3.01A General

20-3.01A(1) Summary

Section 20-3 includes specifications for performing planting work in new and existing landscapes.

20-3.01A(2) Definitions

Reserved

20-3.01A(3) Submittals

20-3.01A(3)(a) General

Submit nursery invoices showing species or variety and inspection certificates for plants.

Submit documentation of clearance from the county agricultural commissioner for plants obtained from a county outside the project limits.

If a root stimulant is required, submit a copy of the root stimulant manufacturer's product sheet and instructions for the application of the root stimulant.

If cuttings are to be taken from outside the right-of-way, submit proof of permits and payment of associated fees. Notify the Engineer of the location at least 15 days before taking cuttings.

20-3.01A(3)(b) Vendor Statements

At least 60 days before planting the plants, submit a statement from the vendor that the order for the plants required, including sample plants used for inspection, has been received and accepted by the vendor. The statement from the vendor must include the plant names, sizes, and quantities and the anticipated delivery date.

20-3.01A(3)(c) Certificates of Compliance

Submit a certificate of compliance for:

1. Sod
2. Soil amendment

20-3.01A(4) Quality Control and Assurance

Plants must comply with federal and state laws requiring inspection for diseases and infestations. Inspection certificates required by law must accompany each shipment of plants.

Obtain clearance from the county agricultural commissioner before planting plants delivered from a county outside the project limits.

The Engineer inspects the roots of container-grown sample plants by removing earth from the rootball of not less than 2 plants, nor more than 2 percent of the total number of plants of each species or variety. If container-grown plants are purchased from several sources, the Engineer inspects the roots of not less than 2 of each sample plant species or variety from each source. The rootball of container grown plants must not show evidence of being underdeveloped, deformed, or having been restricted.

If the Engineer finds noncompliant plants, the entire lot represented by the noncompliant sample plants will be rejected.

Cuttings with mature or brown stems and cuttings that have been trimmed will be rejected.

20-3.01B Materials

20-3.01B(1) General

Notify the Engineer at least 10 days before the plants are shipped to the job site.

20-3.01B(2) Plants

20-3.01B(2)(a) General

Plants must be the variety and size shown and true to the type or name shown. Plants must be individually tagged or tagged in groups identifying the plants by species or variety. Tagging is not required for cuttings.

Plants must be healthy, well-formed, not root-bound, free from insect pests and disease, and grown in nurseries inspected by the Department of Food and Agriculture.

The plants must comply with the size and type shown in the following table:

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

[a]Do not use containers made of biodegradable material.
[b]Grown in individual container cells.
[c]Bare root.

Trucks used for transporting plants must be equipped with covers to protect plants from windburn.

Handle and pack plants in an authorized way for the species or variety.

20-3.01B(2)(b) Cuttings

20-3.01B(2)(b)(i) General

Take cuttings at random from healthy, vigorous plants. Make cuts with sharp, clean tools. Do not take more than 25 percent of an individual plant and not more than 50 percent of the plants in an area.

Keep cuttings covered and wet until planted. Do not allow cuttings to dry or wither.

Plant cuttings no more than 2 days after being cut.

20-3.01B(2)(b)(ii) *Carpobrotus* and *Delosperma* Cuttings

You may take cuttings for new *Carpobrotus* and *Delosperma* groundcover from the existing highway planting areas, but these areas may not provide enough material to complete the work. Contact the local District's encroachment permit office to obtain a permit to harvest cuttings, identify acceptable cutting harvest areas, and to determine acceptable quantities to take.

Take tip cuttings from healthy, vigorous Carpobrotus and Delosperma plants that are free of pests and disease.

Carpobrotus cuttings must be 10 inches or more in length and not have roots.

Delosperma cuttings must be 6 inches or more in length and not have roots.

20-3.01B(2)(b)(iii) Willow Cuttings

Take willow cuttings from areas shown or designated by the Engineer.

Willow cuttings must be:

1. Reasonably straight
2. 20 to 24 inches in length
3. 3/4 to 1-1/2 inch in diameter at the base of the cutting

Cut the top of each willow cutting square above a leaf bud. Cut the base below a leaf bud at approximately a 45 degree angle. Trim off leaves and branches flush with the stem of the cutting.

20-3.01B(2)(b)(iv) Cottonwood Cuttings

Cottonwood cuttings must comply with the requirements for willow cuttings in section 20-3.01B(2)(b)(iii).

20-3.01B(2)(b)(v)–20-3.01B(2)(b)(viii) Reserved

20-3.01B(2)(c) Sod

Sod must:

1. Be grown to comply with the Food & Agri Code
2. Be free from weeds and undesirable types of grasses and clovers
3. Be field-grown on soil containing less than 50 percent silt and clay
3. Have less than 1/2-inch-thick thatch
4. Not be less than 8 months or more than 16 months old
5. Be machine-cut to a uniform soil thickness of 5/8 ± 1/4 inch, not including top growth and thatch

Protect sod with tarps or other protective covers during delivery. Do not allow sod to dry out during delivery or before placement.

20-3.01B(3) Soil Amendment

Soil amendment must comply with the requirements in the Food & Agri Code. Soil amendment must be one or a combination of the following:

1. Sphagnum peat moss
2. Nitrolized fir bark
3. Vermiculite
4. Perlite

20-3.01B(4) Fertilizers

20-3.01B(4)(a) General

Deliver fertilizer in labeled containers showing weight, chemical analysis, and manufacturer's name.

Fertilizer must comply with the requirements of the Food & Agri Code.

20-3.01B(4)(b) Slow-release Fertilizers

Slow-release fertilizer must be a pelleted or granular form with a nutrient release over an 8 to 12 month period and must comply with the chemical analysis ranges shown in the following table:

Ingredient	Content (percent)
Nitrogen (N)	16–21
Phosphoric acid (P)	6–8
Water soluble potash (K)	4–10

20-3.01B(4)(c) Packet Fertilizers

Packet fertilizer must be a biodegradable packet with a nutrient release over a 12 month period. Each packet must have a weight of 10 ± 1 grams and must comply with the chemical analysis shown in the following table:

Ingredient	Content (percent)
Nitrogen(N)	20
Phosphoric acid (P)	10
Water soluble potash (K)	5

20-3.01B(4)(d) Organic Fertilizers

Organic fertilizer must be pelleted or granular with a cumulative nitrogen release rate of no more than 70 percent for the first 70 days after incubation at 86 degrees F with 100 percent at 350 days or more. Organic fertilizer must comply with the chemical analysis shown in the following table:

Ingredient	Content (percent)
Nitrogen (N)	5–7
Phosphoric acid (P)	1–5
Water soluble potash (K)	1–10

20-3.01B(5) Root Stimulants

Root stimulant must be a commercial quality product.

20-3.01B(6) Plaster Sand

Backfill material for the transplant palm tree planting holes must be 100 percent commercial quality washed plaster sand.

20-3.01B(7) Root Barrier

Root barrier must be an injection molded or extruded modular panel made of high-density polypropylene or polyethylene plastic.

Each panel must:

1. Be at least 1/16-inch thick
2. Have at least 4 molded root-deflecting vertical ribs 0.5- to 0.8-inch wide, 6 to 8 inches apart
3. Have a locking strip or an integral male-female sliding lock designed to resist slippage between panels
4. Be at least 2 feet wide and 2 feet in depth

20-3.01B(8) Root Protectors

Each root protector must be:

1. Fabricated from 1-inch, hexagonal pattern, 20-gauge mesh wire
2. Closed bottom design with a height and diameter that provides a minimum of 6 inches of clearance between the root ball and the sides and bottom of the wire cylinder

Wire edges at the top of the cylinder must be the uncut manufactured finished edge free of sharp points.

20-3.01B(9) Foliage Protectors

Each foliage protector must be:

1. Fabricated from 1-inch, hexagonal pattern, 20-gauge mesh wire
2. Approximately 4 feet high and 2 feet in diameter

Wire edges at the top of the cylinder must be the uncut manufactured finished edge free of sharp points. Other wire edges that are cut must be free of sharp points.

Support stakes must be one of the following:

1. 3/4-inch reinforcing steel bar a minimum of 5 feet long with an orange or red plastic safety cap that fits snugly onto the top of the reinforcing steel bar
2. 2 inch nominal diameter or 2 by 2 inch nominal size wood stakes a minimum of 5 feet long. Wood stakes must be straight

The jute mesh cover must comply with section 21-1.02O(2). Twine required to hold the jute mesh cover in place must be 1/8-inch diameter manila hemp twine.

20-3.01B(10) Wood Plant Stakes

Each plant stake must be nominal 2 by 2 inch or nominal 2-inch diameter and of sufficient length to keep the plant in an upright position.

Plant stakes for vines must be nominal 1 by 1 inch,18 inches long.

20-3.01B(11) Plant Ties

Plant ties must be extruded vinyl-based tape, 1 inch wide and at least 10 mils thick.

20-3.01C Construction

20-3.01C(1) General

Apply a root stimulant under the manufacturer's instructions to the plants specified in the special provisions.

Before transporting the plants to the planting area, thoroughly wet the root ball.

20-3.01C(2) Pruning

Prune plants under the latest edition of ANSI A300 part 1, *Pruning*, published by the Tree Care Industry Association.

Do not use tree seal compounds to cover pruning cuts.

20-3.01C(3) Watering

Water existing plants to be maintained, transplanted trees, and new plants as needed to keep the plants in a healthy growing condition.

20-3.01C(4) Replacement Plants

Plants that show signs of failure to grow at any time or are so injured or damaged as to render them unsuitable for the purpose intended, must be removed, replaced, and replanted. Replace unsuitable plants within 2 weeks after the Engineer marks or indicates that the plants must be replaced.

Replacement planting must comply with the original planting requirements, spacing, and size provisions described for the plants being replaced.

Replacement planting for transplanted trees must comply with the work plan and be planted in the same planting hole.

Replacement ground cover plants must be the same species specified for the ground cover being replaced. Other replacement plants must be the same species as the plants being replaced.

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

The Department does not pay for replacement plants or the planting of replacement plants.

20-3.01C(5) Maintain Plants

Maintain plants from the time of planting until Contract acceptance if no plant establishment period is specified or until the start of the plant establishment period.

20-3.01D Payment

Reserved

20-3.02 EXISTING PLANTING

20-3.02A General

20-3.02A(1) Summary

Section 20-3.02 includes specifications for pruning existing plants, transplanting trees, and maintaining existing planted areas.

Transplant palm trees between March 15 and October 15.

20-3.02A(2) Definitions

Reserved

20-3.02A(3) Submittals

Submit a work plan for:

1. Transplanting trees. The work plan must include methods for lifting, transporting, storing, planting, guying, and maintaining each tree to be transplanted. Include root ball size, method of root ball containment, and a maintenance program for each tree.
2. Maintaining existing planted areas. The work plan must include weed control, fertilization, mowing and trimming of turf areas, watering, and controlling rodents and pests.

Submit a copy of the manufacturer's product sheet for root stimulant including application instructions.

20-3.02A(4) Quality Control and Assurance

Inspect for deficiencies of existing planted areas in the presence of the Engineer. Complete the inspection within 15 days after the start of job site activities.

Deficiencies requiring corrective action include:

1. Weeds
2. Dead, diseased, or unhealthy plants
3. Missing plant stakes and tree ties
4. Inadequate plant basins and basin mulch
5. Other deficiencies needing corrective action to promote healthy plant life
6. Rodents and pests

20-3.02B Materials

Not Used

20-3.02C Construction

20-3.02C(1) General

Correct deficiencies of existing planted areas as ordered within 15 days of the order. Correction of deficiencies is change order work.

After deficiencies are corrected, perform work to maintain existing planted areas in a neat and presentable condition and to promote healthy plant growth through Contract acceptance.

20-3.02C(2) Prune Existing Plants

Prune existing plants as shown.

If no bid item for prune existing plants is included, prune existing plants as ordered. Pruning existing plants is change order work.

20-3.02C(3) Transplant Trees

Prune each tree to be transplanted immediately before lifting.

If the tree to be transplanted is a palm, prune by removing dead fronds and frond stubs from the trunk. Remove green fronds up to 2 rows of fronds away from the center of growth. Tie the remaining 2 rows of fronds in an upright position with light hemp or manila rope. Remove fronds and frond stubs at the trunk in a manner that will not injure the trunk. Remove fronds and frond stubs for *Phoenix dactylifera* (Date Palm) approximately 4 inches from the trunk.

Prepare each hole in the new location before lifting the tree to be transplanted.

Lift tree to be transplanted as described in the work plan.

Comply with section 20-3.03C(3) for handling and planting each tree to be transplanted.

Until replanted, cover exposed root ball with wet burlap or canvas and cover the crown with 90 percent shade cloth.

Replant each tree on the same day it is lifted if possible. If the transplant location is not ready to receive the tree, store and maintain the tree to be transplanted until the transplant location is authorized. Store tree in an upright position.

Replace damaged transplanted tree under 20-3.01C(4) and with the number of trees specified in the special provisions.

The replacement trees must be planted in individual plant holes at the location determined by the Engineer within the area of the tree being replaced. Comply with section 20-3.03C(2) for the planting of the replacement trees.

20-3.02C(4) Maintain Existing Planted Areas

If a bid item for maintain existing planted areas is included, the existing plant basins must be kept well-formed and free of sediment. If the existing plant basins need repairs, and the basins contain mulch, replace the mulch after the repairs are done.

Control weeds within the existing planted area and:

1. From the existing planted area limit to the adjacent edges of paving and fences if less than or equal to 12 feet
2. From the existing planted area limit to 6 feet beyond the outer limit of the existing planted area if the adjacent edge of paving or fence is more than 12 feet away
3. Within a 3-foot radius from each existing tree and shrub

If no bid item for maintain existing planted areas is included, maintain existing planted areas as ordered. Maintain existing planted areas is change order work.

20-3.02D Payment

Not Used

20-3.03 PLANTING WORK

20-3.03A General

Section 20-3.03 includes specifications for planting plants.

20-3.03B Materials

Not Used

20-3.03C Construction

20-3.03C(1) General

Do not begin planting until authorized.

If an irrigation system is required, do not begin planting in an area until the functional test has been completed and authorized for the irrigation system serving that area.

20-3.03C(2) Preparing Planting Areas

The location of each plant is as shown unless the Engineer designates otherwise. If the Engineer designates the location, it will be marked by a stake, flag, or other marker.

Conduct work so the existing flow line in drainage ditches is maintained. Material displaced by your operations that interferes with drainage must be removed.

Where a minimum distance to a drainage ditch is shown, locate the plant so that the outer edge of its basin wall is at least the minimum distance shown for each plant involved.

Excavate each planting hole by hand digging or by drilling. The bottom of each planting hole must be flat. Do not use water for excavating the hole.

Unless a larger planting hole is specified, the planting hole must be large enough to receive the root ball or the total length and width of roots, backfill, amendments, and fertilizer. Where rock or other hard material prohibits the hole from being excavated, a new hole must be excavated and the abandoned hole backfilled.

20-3.03C(3) Planting Plants

20-3.03C(3)(a) General

Do not plant plants in soil that is too wet, too dry, not properly conditioned as specified, or in an unsatisfactory condition for planting.

Do not distribute more plants than can be planted and watered on that day.

Water plants immediately after planting. Apply water until the backfill soil around and below the roots or ball of earth around the roots of each plant is thoroughly saturated. When watering with a hose, use a nozzle, water disbursement device, or pressure reducing device. Do not allow the full force of the water from the open end of the hose to fall within the basin around any plant. Groundcover plants in areas with an irrigation system must be watered by sprinklers. Several consecutive watering cycles may be necessary to thoroughly saturate the soil.

If shown, install root barriers between trees and concrete sidewalk or curb. Install panels flush with finished grade and join with locking strips or integral male-female sliding locks. Install barriers with root deflectors facing inward.

If a tree grate is shown, install root barrier panels 0.5 inch above finish grade or as shown.

Adjust planting locations so that each tree or shrub is at least 8 feet away from any sprinkler.

Where a tree, shrub, or vine is to be planted within a groundcover area or cutting planting area, plant it before planting groundcover or cuttings.

Where shrubs and groundcovers are shown to be planted in groups, the outer rows directly adjacent to the nearest roadway or highway fence must be parallel to the nearest roadway or highway fence. Stagger shrubs and groundcovers in adjacent rows. Adjust the alignment of the plants within the outer rows.

Core holes in concrete masonry block wall as shown.

Where a vine is to be planted against a wall or fence, plant it as close as possible to the wall or fence. If a vine planted next to a wall is to be staked, stake and tie the vine at the time of planting. A vine planted next to a fence must be tied to the fence at the time of planting.

Protect tree trunks from injury. Do not:

1. Drag tree
2. Use chains to move a tree
3. Lay tree on the ground

20-3.03C(3)(b) Trees, Shrubs, and Vines

After preparing holes, thoroughly mix soil amendment and granular fertilizer at the rate shown with native soil to be used as backfill material. Remove containers from plants in such a manner that the ball of earth

surrounding the roots is not broken. Do not cut plant containers before delivery of the plants to the planting area. Plant and water plants immediately after removal from their containers.

Place packet fertilizer in the backfill within 6 to 8 inches of the ground surface and approximately 1 inch from the root ball. If more than 1 packet is required per plant, distribute the packets evenly around the root ball.

If a root stimulant is to be used, apply it according to the manufacturer's instructions.

If required, install root protectors in the plant holes as shown.

Ensure roots are not restricted or distorted.

Distribute backfill uniformly throughout the entire depth of the plant hole without clods or lumps. After the planting holes have been backfilled, jet water into the backfill with a pipe or tube inserted into the bottom of the hole until the backfill material is saturated for the full depth. If the backfill material settles below this level, add additional backfill to the required level. If a plant settles deeper than shown, replant it at the required level.

Remove nursery stakes after planting.

Install 2 plant stakes for each plant to be staked at the time of planting as shown. Ensure the rootball is not damaged.

Tie the plant to the stakes with 2 plant ties, 1 tie to each stake. Each tie must form a figure 8 by crossing the tie between the plant and the stake as shown. Install ties at the lowest position that will support the plant in an upright position. Ties must provide trunk flexibility but not allow the trunk to rub against the stakes. Wrap each end of the tie 1-1/2 turns around the stake and securely tie.

Construct a watering basin around each plant as shown.

If required, install a foliage protector:

1. Over the plant within 2 days after planting.
2. Vertically and centered over the plant as shown

If foliage protectors are required:

1. Cut the bottom of the wire cylinder to match the slope of the ground. Do not leave sharp points of wire after cutting. Sharp points must be bent over or blunted.
2. Install 2 support stakes for foliage protectors vertically and embed in the soil on opposite sides of the plant as shown and in a transverse direction to the prevailing wind.
3. Either weave the support stakes through the wire cylinder mesh at 6 inch maximum centers or fasten the wire cylinder to the support stakes at 6 inch maximum centers.
4. Wire cylinder must be snug against the support stakes but loose enough to be raised for pesticide application or to perform weeding within the plant basin.
5. Install jute mesh cover over the foliage protector and secure with twine as shown.

20-3.03C(3)(c) Groundcover Plants

Each groundcover planting area irrigated by a single control valve must be completely planted and watered before planting other groundcover planting areas.

Plant groundcover plants in moist soil, and in neat, straight rows, spaced as shown.

Apply fertilizer to groundcover plants and water into the soil immediately after planting.

20-3.03C(3)(d) Cuttings, Liners, Plugs, and Seedling Plants

20-3.03C(3)(d)(i) General

Apply fertilizer to cuttings, liners, plugs, and seedling plants and water immediately after planting.

Ensure the soil is moist to a minimum depth of 8 inches before planting cuttings.

If a root stimulant is to be used, apply it according to the manufacturer's instructions.

20-3.03C(3)(d)(ii) Willow Cuttings

Unless otherwise shown, for willow cuttings excavate planting holes perpendicular to the ground line by using a steel bar, auger, post hole digger, or similar tools. Holes must be large enough to receive the cuttings and fertilizer packet. Plant willow cuttings to the specified depths without damaging the bark.

Where rock or other hard material prohibits the excavation of the planting holes, excavate new holes and backfill the unused holes.

Plant willow cuttings during the period specified in the special provisions.

Apply root stimulant according to the manufacturer's instructions.

Plant the base of the cutting 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 willow cutting length.

Place 1 fertilizer packet in the backfill of each cutting, 6 to 8 inches below the ground surface 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 that the cutting cannot be easily removed from the soil. Do not damage the cutting's bark.

Dispose of trimmings and unused cuttings.

20-3.03C(3)(d)(iii) Cottonwood Cuttings

Reserved

20-3.03C(3)(d)(iv) *Carpobrotus* and *Delosperma* Cuttings

Plant *Carpobrotus* cuttings to a depth so that not less than 2 nodes are covered with soil. The basal end of *Delosperma* cuttings must not be less than 2 inches below the surface of the soil and the basal end of *Carpobrotus* cuttings must not be less than 4 inches below the surface of the soil.

Apply root stimulant to *Delosperma* cuttings before planting.

Do not plant *Carpobrotus* or *Delosperma* cuttings in soil that does not contain sufficient moisture at an average depth of 2 inches below the surface.

20-3.03C(3)(d)(v) Liner Plants

Plant liner plants during the period specified in the special provisions.

If a foliage protector is required, install under section 20-3.03C(3)(b).

20-3.03C(3)(d)(vi) Plug Plants

Plant plug plants during the period specified in the special provisions.

20-3.03C(3)(d)(vii) Seedling Plants

Plant seedling plants during the period specified in the special provisions.

20-3.03C(3)(e) Sod

After all other planting is performed, grade sod areas to drain and to a smooth and uniform surface. Fine grade and roll sod areas before placing sod.

Areas adjacent to sidewalks, edging, and other paved borders and surfaced areas must be 1 inch below the finished surface elevation of the facilities, after fine grading, rolling, and settlement of the soil.

Place sod such that the end of each adjacent strip is staggered a minimum of 2 feet. Place the edge and end of sod firmly against adjacent sod and against sidewalks, edging, and other paved borders and surfaced areas.

Lightly roll the entire sodded area to eliminate air pockets and ensure close contact with the soil after placement of sod. Water the sodded areas so that the soil is moist to a minimum depth of 4 inches after rolling. Do not allow the sod to dry out.

If irregular or uneven areas appear in the sodded areas, restore to a smooth and even appearance.

Trim sod to a uniform edge at sidewalks, edging, and other paved borders and surfaced areas. Trimming must be repeated whenever the edge of sod extends 1 inch beyond the edge of the edging, sidewalks, and other paved borders and surfaced areas. Remove and dispose of trimmed sod.

Mow sod when it has reached a height of 4 inches. Mow sod to a height of 2.5 inches.

20-3.03D Payment

Soil amendment is measured in the vehicle at the point of delivery.

Measurement for slow-release fertilizer, organic fertilizer, or iron sulfate is determined from marked weight or sack count.

Various sizes and types of plants are measured by either the product of the average plant density and the total area planted or by actual count of the living plants in place, determined by the Engineer. The average plant density is the number of living plants per sq yd determined from actual count of test areas chosen representing the total planted area. The size and location of the test areas is determined by you and the Engineer, except that the total area tested must be equal to not less than 3 percent nor more than 5 percent of the planted area being determined. The Engineer makes the final determination of the areas to be tested.

20-3.04–20-3.08 RESERVED

20-4 PLANT ESTABLISHMENT WORK

20-4.01 GENERAL

20-4.01A Summary

Section 20-4 includes specifications for performing plant establishment work.

Plant establishment consists of caring for the plants, including watering, fertilizing, pruning, replacing damaged plants, pest control, and operating and repairing of all existing irrigation facilities used and irrigation facilities installed as part of the new irrigation system.

Working days on which no work is required, as determined by the Engineer, will be credited as a plant establishment working day, regardless of whether or not you perform plant establishment work.

Working days whenever you fail to adequately perform plant establishment work will not be credited toward the plant establishment working days.

20-4.01B Definitions

Type 1 plant establishment: Plant establishment period with the number of working days specified for plant establishment beginning after all work has been completed except for plant establishment work and other bid items specified to be performed until Contract acceptance.

Type 2 plant establishment: Plant establishment period with the number of working days specified for plant establishment beginning after all planting work has been completed except for plant establishment work and other bid items specified to be performed until Contract acceptance, provided that the Contract must not be accepted unless the plant establishment work has been satisfactorily performed for at least the number of working days specified for plant establishment.

If maintenance and protection relief is granted for a completed portion of the work under section 5-1.38, Type 2 plant establishment period for the completed portion of the work is the time between completion of all planting work except for plant establishment work, and the granting of maintenance and protection relief, provided that the relief must not be granted unless the plant establishment work in the completed portion of the work has been satisfactorily performed for at least the number of working days specified for the plant establishment period.

20-4.01C Submittals

20-4.01C(1) General

Submit seasonal watering schedules for use during the plant establishment period within 10 days after the start of the plant establishment period. Remote irrigation control system watering schedule must utilize the remote irrigation control system software program.

Submit updated watering schedules within 5 business days after any changes have been made to the authorized schedules.

Submit a revised watering schedule for each irrigation controller not less than 30 days before completion of the plant establishment period.

20-4.01C(2) Notification

The Engineer will notify you in writing when the plant establishment period begins and will furnish statements regarding the number of working days credited to the plant establishment period after the notification.

Notify the Engineer at least 5 business days before applying each application of fertilizer.

20-4.01D Quality Control and Assurance

Provide training by a qualified person on the use and adjustment of the irrigation controllers installed, 30 days before completion of the plant establishment period.

Perform a final inspection of the plant establishment work in the presence of the Engineer between 20 and 30 days before Contract acceptance.

20-4.02 MATERIALS

20-4.02A General

Reserved

20-4.02B Fertilizers

Fertilizer must comply with section 20-3.01B(5).

20-4.03 CONSTRUCTION

20-4.03A General

Remove trash and debris.

Surplus earth accumulated in roadside clearing and planting areas must be removed.

Trim and mow turf areas as specified for sod in section 20-3.03C(3)(e). Dispose of trimmed and mowed material.

If irregular or uneven areas appear within turf areas, restore to a smooth and even appearance. Reseed turf seed areas.

Remove the tops of foliage protectors if plants become restricted.

Remove foliage protectors, including support stakes, within 30 days before the completion of the plant establishment period.

Keep plant basin walls well formed.

Clean new wye strainers and existing wye strainers that are a part of the new irrigation system annually until the completion of the plant establishment period. The last cleaning must be done within 15 days before the completion of the plant establishment period.

Remove, clean, and reinstall new filters and existing filters that are a part of the new irrigation system annually until the completion of the plant establishment period. The last cleaning must be done within 15 days before the completion of the plant establishment period.

20-4.03B Plant Growth Control

Prune plants planted as part of the Contract as authorized.

Remove plant growth that extends within 2 feet of sidewalks, curbs, dikes, shoulders, walls or fences.

Remove proposed and existing ground cover from within the plant basins, including basin walls, turf areas, and planting areas within edging.

Vines next to walls and fences must be kept staked and tied. Train vines on fences and walls or through cored holes in walls.

20-4.03C Fertilizers

Apply fertilizer to the plants as specified and water into the soil after each application.

Apply fertilizer at the rates shown and spread with a mechanical spreader, whenever possible.

20-4.03D Weed Control

Control weeds under section 20-1.03C(3).

20-4.03E Plant Staking

Replace the plant stakes that are inadequate to support plants with larger stakes.

Remove plant stakes when the Engineer determines they are no longer needed.

20-4.03F Replacement Plants

Replacement plants must comply with section 20-3.01C(4).

Replacement of plants up to and including the 125th plant establishment working day must be with a plant of the same size as originally specified. Plants of a larger container size than those originally specified for replacement plants may be used during the first 125 working days of the plant establishment period.

Replacement of plants after the 125th plant establishment working day must comply with the following size requirements:

Plant size (Original)	Plant size (Replacement)
Pot/liner/plug/ seedling	No. 1 container
No. 1 container	No. 5 container
No. 5 container	No. 15 container

Other replacement plants must be the same size as originally specified.

Replacement ground cover plants must comply with the following spacing requirements:

Original spacing (inches)	On center spacing of replacement ground cover plants (inches)		
	Number of completed plant establishment working days		
	1–125	126–190	191–End of plant establishment period
9	9	6	6
12	12	9	6
18	18	12	9
24	24	18	12
36	36	24	18

20-4.03G Watering

Operate the electric automatic irrigation systems in the automatic mode unless authorized.

If any component of the electric automatic irrigation system is operated manually, the day will not be credited as a plant establishment working day unless the manual operation is authorized.

Water plants utilizing the remote irrigation control system software program unless authorized.

Implement the watering schedule at least 10 days before completion of the plant establishment period.

20-4.04 PAYMENT

Not Used

20-5 LANDSCAPE ELEMENTS

20-5.01 GENERAL

20-5.01A General

Section 20-5 includes specifications for constructing and installing landscape elements.

20-5.01B Materials

Not Used

20-5.01C Construction

Earthwork must comply with section 19.

20-5.01D Payment

Not Used

20-5.02 EDGING

20-5.02A General

Section 20-5.02 includes specifications for constructing landscape edging.

20-5.02B Materials

20-5.02B(1) General

Reserved

20-5.02B(2) Header Board Edging

Lumber for header board edging must be one of the following types:

1. Construction grade cedar
2. Pressure-treated Douglas fir
3. Construction heart grade redwood complying with section 57-2.01B(2)

Lumber must be:

1. Rough cut from sound timber.
2. Straight. Sweep must not exceed 1 inch in 6 feet.
3. Free from loose or unsound knots. Knots must be sound, tight, well spaced, and not to exceed 2 inches in size on any face.
4. Free of shakes in excess of 1/3 the thickness of the lumber.
5. Free of splits longer than the thickness of the lumber.
6. Free of other defects that would render the lumber unfit structurally for the purpose intended.

Edging anchors for header board edging must be stakes of the size and shape shown.

20-5.02B(3) Metal Edging

Metal edging must be commercial quality, made of aluminum or steel, and have an L-shaped design. Edging must be a minimum of 4 inches in height. The thickness must be as recommended by the manufacturer for the use intended.

Edging anchors must be from the same manufacturer as the metal edging.

20-5.02B(4) High Density Polyethylene Edging

HDPE edging must be commercial quality and a minimum of 4 inches in height. The thickness must be as recommended by the manufacturer for commercial installation for the use intended.

Edging anchors must be from the same manufacturer as HDPE edging.

20-5.02B(5) Concrete Edging

Concrete for edging must be minor concrete.

20-5.02B(6)–20-5.02B(10) Reserved

20-5.02C Construction

20-5.02C(1) General

Where edging is used to delineate the limits of inert ground cover or mulch areas, install edging before installing inert ground cover or mulch areas.

Saw cut surfaces where (1) asphalt concrete or concrete surfacing must be removed to permit the installation of edging and (2) no joint exists between the surfacing to be removed and the surfacing to remain in place. The surfacing must be cut in a straight line to a minimum depth of 2 inches with a power-driven saw before the surfacing is removed. Spike or stake spacing must comply with the manufacturer's instructions for use and site conditions.

20-5.02C(2) Header Board Edging

Each stake must be driven flush with the top edge of the header board edging and the stake top must be beveled away from the header board at a 45 degree angle. Attach stake to header board with a minimum of two 12-penny hot dipped galvanized nails per stake.

20-5.02C(3) Metal and High Density Polyethylene Edging

Spike or stake spacing must comply with the manufacturer's instructions for use and site conditions.

20-5.02C(4) Concrete Edging

Construct and finish minor concrete edging under section 73-2.

20-5.02C(5)–20-5.02C(9) Reserved

20-5.02D Payment

Edging is measured parallel to the ground surface.

20-5.03 INERT GROUND COVERS AND MULCHES

20-5.03A General

20-5.03A(1) General

20-5.03A(1)(a) Summary

Section 20-5.03 includes specifications for installing inert ground covers and mulches.

20-5.03A(1)(b) Definitions

Reserved

20-5.03A(1)(c) Submittals

Submit:

1. Filter fabric product data including the manufacturer's product sheet and installation instructions
2. Certificate of compliance for filter fabric at least 5 business days before delivery of the material to the job site

20-5.03A(1)(d) Quality Control and Assurance

Reserved

20-5.03A(2) Materials

Soil sterilant must be oxadiazon granular preemergent and must comply with section 20-1.02C.

Filter fabric must be Class A. Staples for filter fabric must comply with section 21-1.02R.

20-5.03A(3) Construction

20-5.03A(3)(a) General

Before performing inert ground cover and mulch work, remove plants and weeds to ground level.

20-5.03A(3)(b) Earthwork

Excavate areas to receive inert ground cover or mulch to the depth shown. Maintain the planned flow lines, slope gradients, and contours of the job site. Grade subgrade to a smooth and uniform surface and compact to not less than 90 percent relative compaction.

20-5.03A(3)(c) Treatment of Soil

After compaction, apply soil sterilant at the maximum label rate. Do not apply soil sterilant more than 12 inches beyond the inert ground cover or mulch limits. The soil sterilant application and inert ground cover or mulch placement must be completed within the same work day.

20-5.03A(3)(d) Filter Fabric

Immediately before placing filter fabric, surfaces to receive filter fabric must be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation.

Align fabric and place in a wrinkle-free manner.

Overlap adjacent rolls of the fabric from 12 to 18 inches. Spread each overlapping roll in the same direction. Fasten fabric with staples flush with the adjacent fabric to prevent movement of fabric by placement of inert ground cover or mulch.

Repair or replace fabric damaged during placement of inert ground cover or mulch with sufficient fabric to comply with overlap requirements.

20-5.03A(4) Payment

Not Used

20-5.03B Rock Blanket

20-5.03B(1) General

20-5.03B(1)(a) Summary

Section 20-5.03B includes specifications for placing rock blanket.

20-5.03B(1)(b) Definitions

Reserved

20-5.03B(1)(c) Submittals

Submit a 1 sq yd sample of the various rock sizes.

20-5.03B(1)(d) Quality Control and Assurance

Reserved

20-5.03B(2) Materials

20-5.03B(2)(a) General

Do not use filter fabric.

20-5.03B(2)(b) Concrete

Concrete must be minor concrete.

20-5.03B(2)(c) Rock

Rock must be clean, smooth, and obtained from a single source and must comply with the following grading requirements:

Grading Requirements

Screen size (inches)	Percentage passing
8	100
6	50-85
4	0-50

20-5.03B(2)(d) Mortar

Mortar must comply with section 51-1.02F.

20-5.03B(3) Construction

Place concrete as shown.

Rock must be placed while concrete is still plastic. Remove concrete adhering to the exposed surfaces of the rock.

Loose rocks or rocks with a gap greater than 3/8 inch must be reset by an authorized method. The rock gap is measured from the edge of the rock to the surrounding concrete bedding.

Place mortar as shown.

20-5.03B(4) Payment

Rock blanket is measured parallel to the rock blanket surface.

20-5.03C Gravel Mulch

20-5.03C(1) General

20-5.03C(1)(a) Summary

Section 20-5.03C includes specifications for placing gravel mulch.

20-5.03C(1)(b) Definitions

Reserved

20-5.03C(1)(c) Submittals

Submit a 5-lb sample of the gravel mulch.

20-5.03C(1)(d) Quality Control and Assurance

Reserved

20-5.03C(2) Materials

Gravel mulch must be:

1. Uniform gray color
2. From a single source only
3. Crushed rock that complies with the following grading requirements:

Grading Requirements

Sieve size	Percent passing
1-1/4 inch	100
3/4 inch	60-80
1/2 inch	45-65
No. 40	5-20

20-5.03C(3) Construction

Place gravel and compact by rolling.

The finished gravel mulch surface must be smooth and uniform, maintaining original flow lines, slope gradients, and contours of the job site.

20-5.03C(4) Payment

Gravel mulch is measured parallel to the gravel mulch surface.

20-5.03D Decomposed Granite

20-5.03D(1) General

20-5.03D(1)(a) Summary

Section 20-5.03D includes specifications for placing decomposed granite.

20-5.03D(1)(b) Definitions

Reserved

20-5.03D(1)(c) Submittals

Five business days before delivery of the materials to the job site, submit:

1. Solidifying emulsion product data including the manufacturers' product sheets and installation instructions
2. Certificate of compliance for solidifying emulsion
3. 5-lb sample of the decomposed granite

20-5.03D(1)(d) Quality Control and Assurance

Test plot must be:

1. Constructed at an authorized location
2. At least 3 by 12 feet
3. Constructed using the materials, equipment, and methods to be used in the work
4. Authorized before starting work

Notify the Engineer not less than 7 days before constructing the test plot.

The Engineer uses the authorized test plot to determine acceptability of the work.

If ordered, prepare additional test plots. Additional test plots are change order work.

If the test plot is not incorporated into the work, the Engineer may order you to remove it.

20-5.03D(2) Materials

20-5.03D(2)(a) General

Decomposed granite must be:

1. Uniform gray or tan color
2. From one source only
3. Crushed granite rock that complies with grading requirements shown in the following table:

Grading Requirements

Sieve size	Percent passing
3/8 inch	100
No. 4	95–100
No. 8	75–80
No. 16	55–65
No. 30	40–50
No. 50	25–35
No. 100	20–25
No. 200	5–15

Note:
Grading based upon AASHTO T11-82 and T27-82

20-5.03D(2)(b) Solidifying Emulsion

Solidifying emulsion must be either a water-based polymer or nontoxic organic powdered binder specifically manufactured to harden decomposed granite. The solidifying emulsion must not alter the decomposed granite color.

20-5.03D(3) Construction

Do not place decomposed granite during rainy conditions.

Mix solidifying emulsion thoroughly and uniformly throughout the decomposed granite and under the manufacturer's instructions. Mix the material in the field using portable mixing equipment, or delivered in mixer trucks from a local ready-mixed plant.

Place decomposed granite uniformly in layers no more than 1-1/2 inch thick. Compact each layer of decomposed granite to a relative compaction of not less than 90 percent. Begin compaction within 6 to 48 hours of placement.

If the material was mixed in the field, apply an application of solidifying emulsion after compaction as recommended by the manufacturer. Prevent runoff or overspray of solidifying emulsion onto adjacent paved or planting areas.

The finished decomposed granite surface must be smooth and uniform, compacted to a relative compaction of not less than 90 percent, maintaining original flow lines, slope gradients, and contours of the job site.

20-5.03D(4) Payment

Not Used

20-5.03E Wood Mulch

20-5.03E(1) General

20-5.03E(1)(a) Summary

Section 20-5.03E includes specifications for placing wood mulch.

20-5.03E(1)(b) Definitions

Reserved

20-5.03E(1)(c) Submittals

Submit a certificate of compliance for mulch.

Submit a 2 cu ft mulch sample with the mulch source listed on the bag and obtain approval before delivery of mulch to the job site.

20-5.03E(1)(d) Quality Control and Assurance

Reserved

20-5.03E(2) Materials

20-5.03E(2)(a) General

Mulch must not contain more than 0.1 percent of deleterious materials such as rocks, glass, plastics, metals, clods, weeds, weed seeds, coarse objects, sticks larger than the specified particle size, salts, paint, petroleum products, pesticides or other chemical residues harmful to plant or animal life.

Do not use filter fabric.

20-5.03E(2)(b) Tree Bark Mulch

Tree bark mulch must be derived from cedar, Douglas fir, or redwood species.

Tree bark mulch must be ground so that at least 95 percent of the material by volume is less than 2 inches and no more than 30 percent by volume is less than 1 inch.

20-5.03E(2)(c) Wood Chip Mulch

Wood chip mulch must:

1. Be derived from clean wood
2. Not contain leaves or small twigs
3. Contain at least 95 percent wood chips by volume with average thickness of 1/16 to 3/8 inch in any direction and 1/2 to 3 inches in length

20-5.03E(2)(d) Shredded Bark Mulch

Shredded bark mulch must:

1. Be derived from trees
2. Be a blend of loose, long, thin wood, or bark pieces

3. Contain at least 95 percent wood strands by volume with average thickness of 1/8 to 1-1/2 inches in any direction and 2 to 8 inches in length

20-5.03E(2)(e) Tree Trimming Mulch

Tree trimming mulch must:

1. Be derived from chipped trees and may contain leaves and small twigs.
2. Contain at least 95 percent material by volume less than 3 inches and no more than 30 percent by volume less than 1 inch

20-5.03E(2)(f)–20-5.03E(2)(j) Reserved

20-5.03E(3) Construction

Spread mulch placed in areas outside of plant basins to a uniform thickness as shown.

Mulch must be placed at the rate described and placed in the plant basins or spread in areas as shown after the plants have been planted. Mulch placed in plant basins must not come in contact with the plant crown and stem.

Spread mulch from the outside edge of the proposed plant basin or plant without basin to the adjacent edges of shoulders, paving, retaining walls, dikes, edging, curbs, sidewalks, walls, fences, and existing plantings. If the proposed plant or plant without basin is 12 feet or more from the adjacent edges of shoulders, paving, retaining walls, dikes, edging, curbs, sidewalks, walls, fences, and existing plantings, spread the mulch 6 feet beyond the outside edge of the proposed plant basin or plant without basin.

Do not place mulch within 4 feet of:

1. Flow line of earthen drainage ditches
2. Edge of paved ditches
3. Drainage flow lines

20-5.03E(4) Payment

Mulch is measured in the vehicle at the point of delivery.

20-5.03F–20-5.03J Reserved

20-5.04 RESERVED

Reserved

20-5.05 SITE FURNISHINGS

20-5.05A General

Section 20-5.05 includes specifications for installing site furnishings.

20-5.05B–20-5.05Z Reserved

20-5.06–20-5.10 RESERVED

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04-20-12

Delete the last paragraph of section 21-1.02E.

Replace section 21-1.02F(2) with:

04-20-12

21-1.02F(2) Reserved

Replace "20-7.02D(1)" in the 1st paragraph of section 21-1.02H with:

07-19-13

20-3.01B(4)

Replace section 21-1.02J with:

04-20-12

21-1.02J Reserved

Replace the row for organic matter content in the table in the 4th paragraph of section 21-1.02M with:

01-18-13

Organic matter content	TMECC 05.07-A Loss-on-ignition organic matter method (LOI) % dry weight basis	30–100

Replace the paragraph in section 21-1.02P with:

10-19-12

Fiber roll must be a premanufactured roll filled with rice or wheat straw, wood excelsior, or coconut fiber. Fiber roll must be covered with biodegradable jute, sisal, 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

Fiber roll must have a minimum functional longevity of 1 year.

Add between the 1st and 2nd paragraphs of section 21-1.03A:

01-18-13

Remove and dispose of trash, debris, and weeds in areas to receive erosion control materials.

Remove and dispose of loose rocks larger than 2-1/2 inches in maximum dimension unless otherwise authorized.

Protect the traveled way, sidewalks, lined drainage channels, and existing vegetation from overspray of hydraulically-applied material.

Replace section 21-1.03B with:

01-18-13

21-1.03B Reserved

Replace "3 passes" in item 2 in the list in the 2nd paragraph of section 21-1.03G with:

04-19-13

2 passes

Replace section 21-1.03I with:

04-20-12

21-1.03I Reserved

Add between the 4th and 5th paragraphs of section 21-1.03P:

10-19-12

If soil conditions do not permit driving the stakes into the soil, drill pilot holes to facilitate driving of the stakes.

01-18-13

Delete the 1st and 2nd sentences of the 3rd paragraph in section 21-1.04.

^^^

Submittals for cementitious material must comply with section 90-1.01C(3).

Submit QC test results within 24 hours of test completion.

28-2.01C(2) Field Qualification

For each field qualification foreach mix design, manufacture 12 specimens under ASTM C 31 and submit six of the specimens from 24 to 72 hours after manufacture. Use one batch for all 12 specimens.

Submit field qualification data and test reports including:

1. Mixing date
2. Mixing equipment and procedures used
3. Batch volume in cu yd, the minimum is 5 cu yd
4. Type and source of ingredients used
5. Age and strength from compression strength results

Field qualification test reports must be signed by the official in responsible charge of the laboratory performing the tests.

28-2.01D Quality Control and Assurance

28-2.01D(1) General

Stop LCB activities and immediately notify the Engineer whenever:

1. Any quality control or acceptance test result does not comply with the specifications
2. Visual inspection shows noncompliant LCB

If LCB activities are stopped, before resuming activities:

1. Inform the Engineer of the adjustments you will make
2. Remedy or replace the noncompliant LCB
3. Obtain authorization

Molds for compressive strength testing under ASTM C 31 or ASTM C 192 must be 6 by 12 inches.

Quality control and assurance for cementitious materials and admixtures must comply with section 90-1.01D(1)

28-2.01D(2) Aggregate Qualification Testing

Qualify the aggregate for each proposed aggregate source and gradation. Qualification tests include (1) sand equivalent and (2) average 7-day compressive strength under ASTM C 39 on 3 specimens manufactured under ASTM C 192. The cement content for this test must be 300 lb/cu yd, and the 7-day average compressive strength must be at least 610 psi. Cement must be Type II portland cement under section 90-1.02B(2).

LCB must have from 3 to 4 percent air content during aggregate qualification testing.

28-2.01D(3) Field Qualification Testing

Before placing LCB, you must perform field qualification testing and obtain authorization for each mix design. Retest and obtain authorization for changes to authorized mixed designs.

Proposed mix designs must be field qualified before you place the LCB represented by those mix designs. Use an American Concrete Institute (ACI) certified "Concrete Laboratory Technician, Grade I" to perform field qualification tests and calculations.

Notify the Engineer at least 5 days before field qualification. Perform field qualification within the job site or a location authorized by the Engineer.

Field qualification testing includes compressive strength, air content, and penetration or slump in compliance with the table titled "Quality Control Requirements."

Field qualification testing for compressive strength must comply with the following:

1. Manufacture 12 cylinders under ASTM C 31 from a single batch

2. Perform 3 tests; each test consists of determining the average compressive strength of 2 cylinders at 7 days under ASTM C 39
3. The average compressive strength for each test must be at least 530 psi

If you submitted a notice to produce LCB qualifying for a transverse contraction joint waiver, manufacture additional specimens and test LCB for compressive strength at 3 days. Prepare compressive strength cylinders under ASTM C 31 at the same time using the same material and procedures as the 7-day compressive strength cylinders except do not submit 6 additional test cylinders. The average 3-day compressive strength for each test must be not more than 500 psi.

28-2.01D(4) Quality Control Testing

Provide a testing laboratory to perform quality control tests. Maintain sampling and testing equipment in proper working condition. Perform sampling under California Test 125.

Testing laboratories and testing equipment must comply with the Department's Independent Assurance Program.

Perform quality control sampling, testing, and inspection throughout LCB production and placement. LCB must comply with the requirements for the quality characteristics shown in the following table:

Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Requirement
Sand equivalent (min)	ASTM D 2419	1 per 500 cubic yards but at least 1 per day of production	18
Aggregate gradation	ASTM C 136		Note a
Air content (max, percent) [b]	ASTM C 231		4
Penetration (inches)	ASTM C 360		0 to 1-1/2 nominal [c, d]
Slump (inches)	ASTM C 143		0–3 nominal [c, d]
Compressive strength (min, psi at 7 days)	ASTM C 39 [e]		530
Compressive strength (max, psi at 3 days) [f]	ASTM C 39 [e]		500

[a] Comply with the table titled "Aggregate Grading" in section 28-2.02C.
[b] If no single test in the first 5 air content tests exceeds 1-1/2 percent, no further air content tests are required.
[c] Maximum penetration must not exceed 2 inches and maximum slump must not exceed 4 inches
[d] Test for either penetration or slump
[e] Prepare cylinders under ASTM C 31
[f] Only applicable if you (1) submitted a notice stating intent to produce LCB qualifying for a transverse contraction joint waiver and (2) successfully field qualified the LCB for 3-day compressive strength. Make cylinders at the same time using the same material and procedures as QC testing for 7-day compressive strength.

28-2.01D(5) Acceptance Criteria

For acceptance, properties of LCB must comply with values shown in the following table:

Acceptance Criteria Testing

Property	Test method	Value
Compressive strength (min, psi at 7 days)	ASTM C 39 [a]	530 [b]

[a] Cylinders prepared under ASTM C 31
[b] A compressive strength test represents up to (1) 1,000 cu yd or (2) 1 day's production if less than 1,000 cu yd.

28-2.02 MATERIALS

28-2.02A General

Water must comply with section 90-1.02D.

The air content in LCB must not exceed 4 percent. If the aggregate used for LCB is produced from processed reclaimed asphalt concrete or other material that may cause the air content to exceed 4 percent, reduce the air content with an admixture.

A water-reducing chemical admixture may be used. Water-reducing chemical admixture must comply with ASTM C 494, Type A or Type F.

Air-entraining admixtures must comply with section 90-1.02E.

28-2.02B Cementitious Material

Portland cement must comply with section 90-1.02B. Portland cement content must not exceed 300 lb/cu yd.

SCM must comply with section 90-1.02B except the equations for SCM content under 90-1.02B(3) do not apply.

For aggregate qualification testing, use Type II portland cement under section 90-1.02B(2) without SCM.

28-2.02C Aggregate

Aggregate must be clean and free from decomposed material, organic material, and other deleterious substances. Aggregate samples must not be treated with lime, cement, or chemicals before testing for sand equivalent.

Use either 1-1/2 inch or 1 inch grading. Do not change your selected aggregate grading without authorization.

When tested under ASTM C 136, the percentage composition by weight of the aggregate must comply with the grading requirements for the sieve sizes shown in the following table:

Aggregate Grading

Sieve sizes	Percentage passing			
	1-1/2" maximum		1" maximum	
	Operating range	Contract compliance	Operating range	Contract compliance
2"	100	100	--	--
1-1/2"	90-100	87-100	100	100
1"	--	--	90-100	87-100
3/4"	50-85	45-90	50-100	45-100
3/8"	40-75	35-80	40-75	35-80
No. 4	25-60	20-65	35-60	30-65
No. 30	10-30	6-34	10-30	6-34
No. 200	0-12	0-15	0-12	0-15

Aggregate must comply with the quality requirements shown in the following table:

Aggregate Quality

Property	Test Method	Operating range	Contract compliance
Sand equivalent (min)	ASTM D 2419	21	18
Compressive strength (min, psi at 7 days)	ASTM C 192 ASTM C 39	--	610 at 300 lb/cu yd cement content

Note: Cement must be Type II portland cement under section 90-1.02B(2).

If the aggregate grading or the sand equivalent test results, or both comply with contract compliance requirements but not operating range requirements, you may continue placing LCB for the remainder of the work day. Do not place additional LCB until you demonstrate the LCB to be placed complies with the operating range requirements.

28-2.03 CONSTRUCTION

28-2.03A General

Do not allow traffic or equipment on the LCB for at least 72 hours after the 1st application of the curing compound and completion of contraction joints. Limit traffic and equipment on the LCB to that is required for placing additional layers of LCB or paving.

28-2.03B Subgrade

Immediately before spreading LCB, the subgrade must:

1. Comply with the specified compaction and elevation tolerance for the material involved
2. Be free from loose or extraneous material
3. Be uniformly moist

Areas of subgrade lower than the grade established by the Engineer must be filled with LCB. The Department does not pay for filling low areas of subgrade.

28-2.03C Proportioning, Mixing, and Transporting

Proportion LCB under section 90-1.02F except aggregate does not have to be separated into sizes.

Mix and transport LCB under section 90-1.02G except the 5th and 7th paragraphs in section 90-1.02G(6) do not apply.

28-2.03D Placing

Place LCB under section 40-1.03H(1) except the 3rd paragraph does not apply.

Unless otherwise described, construct LCB in minimum widths of 12 feet separated by construction joints. For LCB constructed monolithically in widths greater than 26 feet, construct a longitudinal contraction joint offset no more than 3 feet from the centerline of the width being constructed.

Contraction joints must comply with section 40-1.03D(3).

Construct transverse contraction joints in intervals that result in LCB areas where the lengths and widths are within 20 percent of each other. Measure the widths from any longitudinal construction or longitudinal contraction joints.

The Engineer waives the requirement for transverse contraction joints if you:

1. Submitted a notice under 28-2.01C(1)
2. Successfully field qualified LCB for 3-day compressive strength testing
3. Submit QC test results for 3-day compressive strength under section 28-2.01D(4).

If concrete pavement will be placed on LCB, construct longitudinal construction and longitudinal contraction joints in the LCB. Provide at least 1 foot horizontal clearance from planned longitudinal construction and longitudinal contraction joints in the concrete pavement.

Do not mix or place LCB when the atmospheric temperature is below 35 degrees F. Do not place LCB on frozen ground.

28-2.03E Finishing

Place LCB under section 40-1.03H(4) or under section 40-1.03H(5) except where there are confined work areas and when authorized:

1. Spread and shape LCB using suitable powered finishing machines and supplement with hand work as necessary
2. Consolidate LCB using high-frequency internal vibrators within 15 minutes after LCB is deposited on the subgrade
3. Vibrate with care such that adequate consolidation occurs across the full paving width and do not use vibrators for extensive weight shifting of the LCB

For LCB to be paved with HMA, before curing operation texture the LCB finished surface by dragging a broom, burlap, or a spring steel tine device. If using a spring steel tine device, the device must produce a

scored surface with scores parallel or transverse to the pavement centerline. Texture at a time and in a manner that produces the coarsest texture for the method used.

For LCB to be paved with HMA, the finished surface must not vary more than 0.05 foot from the grade established by the Engineer.

Do not texture LCB that will be covered with concrete pavement. Before applying curing compound, finish LCB to a smooth surface free from mortar ridges and other projections.

For LCB to be paved with concrete pavement, the finished surface must not be above the grade, or more than 0.05 foot below the grade established by the Engineer.

The finished surface must be free from porous areas.

28-2.03F Curing

After finishing LCB, cure LCB with pigmented curing compound under section 90-1.03B(3) and 40-1.03K except for LCB to be paved with concrete pavement, comply with section 36-2. Apply curing compound to the area to be paved with concrete pavement:

1. In 2 separate applications
2. Before the atmospheric temperature falls below 40 degrees F
3. At a rate of 1 gal/150 sq ft for the first application
4. At a rate of 1 gal/200 sq ft for the second application. Within 4 days after the first application, clean the surface and apply the second application.

Immediately repair damage to the curing compound or LCB.

28-2.03G Surfaces Not Within Tolerance

Where LCB will be paved with concrete pavement, remove the base wherever the surface is higher than the grade established by the Engineer and replace it with LCB. Where LCB will not be paved with concrete pavement, remove the base wherever the surface is higher than 0.05 foot above the grade established by the Engineer and replace it with LCB. If authorized, grind the surface with either a diamond or carborundum blade to within tolerance. After grinding LCB to be paved with concrete pavement and after all free water has left the surface, clean foreign material and grinding residue from the surface. Apply curing compound to the ground area at a rate of approximately 1 gal/150 sq ft.

Where the surface of LCB is lower than 0.05 foot from the grade established by the Engineer, remove the base and replace it with LCB or, if authorized, fill low areas according to the pavement material as follows:

1. For HMA pavement, fill low areas with HMA that complies with the specifications for the lowest layer of pavement. Do not fill low areas concurrently with the paving operation.
2. For concrete pavement, fill low areas with pavement concrete concurrent with the paving operation.

28-2.04 PAYMENT

LCB is measured from the dimensions shown.

Replace section 28-3 with:

07-19-13

28-3 RAPID STRENGTH CONCRETE BASE

Reserved

Replace section 28-4 with:

07-19-13

28-4 LEAN CONCRETE BASE RAPID SETTING

Reserved

Replace section 28-5 with:

07-19-13

28-5 CONCRETE BASE

Reserved

Add to section 28:

07-19-13

28-6–28-14 RESERVED

28-15 REPLACE BASE

Reserved

^^^

DIVISION V SURFACINGS AND PAVEMENTS

Replace section 36 with:

07-19-13

36 GENERAL

07-19-13

36-1 GENERAL

Section 36 includes general specifications for constructing surfacings and pavements.

36-2 BASE BOND BREAKER

Reserved

36-3–36-15 RESERVED

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37 BITUMINOUS SEALS

07-19-13

Replace section 37-1.01 with:

01-18-13

37-1.01 GENERAL

37-1.01A Summary

Section 37-1 includes general specifications for applying bituminous seals.

37-1.01B Definitions

Reserved

37-1.01C Submittals

Reserved

37-1.01D Quality Control and Assurance

37-1.01D(1) General

Reserved

37-1.01D(2) Prepaving Conference

For seal coats and micro-surfacing, schedule a prepaving conference at a mutually agreed upon time and place to meet with the Engineer.

Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. Paving construction foreman
3. Traffic control foreman

Be prepared to discuss:

1. Quality control
2. Acceptance testing
3. Placement
4. Training on placement methods
5. Checklist of items for proper placement
6. Unique issues specific to the project, including:
   - 6.1. Weather
   - 6.2. Alignment and geometrics
   - 6.3. Traffic control issues

6.4. Haul distances
6.5. Presence and absence of shaded areas
6.6. Any other local issues

37-1.02 MATERIALS

Not Used

37-1.03 CONSTRUCTION

Not Used

37-1.04 PAYMENT

Not Used

Replace section 37-2 with:

07-19-13

37-2 SEAL COATS

37-2.01 GENERAL

37-2.01A General

37-2.01A(1) Summary

Section 37-2 includes specifications for applying seal coats.

37-2.01A(2) Definitions

Reserved

37-2.01A(3) Submittals

Reserved

37-2.01A(4) Quality Control and Assurance

The following personnel must attend the prepaving conference:

1. Aggregate suppliers
2. Chip spreader operators
3. Emulsion and binder distributor
4. Coated chips producer if coated chips are used

37-2.01B Materials

Screenings must be broken stone, crushed gravel, or both. At least 90 percent of screenings by weight must be crushed particles as determined under California Test 205.

Screenings for seal coats must have the properties specified in the following table:

Seal Coat Screenings

Properties	Test method	Specification
Los Angeles Rattler, %, max Loss at 100 revolutions. Loss at 500 revolutions.	California Test 211	 10 40
Film stripping, %, max	California Test 302	25

37-2.01C Construction

37-2.01C(1) General

Wherever final sweeping or brooming of the seal coat surface is complete, place permanent traffic stripes and pavement markings within 10 days.

If you fail to place the permanent traffic stripes and pavement markings within the specified time, the Department withholds 50 percent of the estimated value of the seal coat work completed that has not received permanent traffic stripes and pavement markings.

37-2.01C(2) Equipment

Equipment for seal coats must include and comply with the following:

1. Screenings haul trucks. Haul trucks must have:
   - 1.1. Tailgates that discharge screenings
   - 1.2. Devices to lock onto the rear screenings spreader hitch
   - 1.3. Dump beds that will not push down on the spreader when fully raised
   - 1.4. Dump beds that will not spill screenings on the roadway when transferred to the spreader hopper
   - 1.5. Tarpaulins to cover precoated screenings when haul distance exceeds 30 minutes or ambient temperature is less than 65 degrees F
2. Self-propelled screenings spreader. The spreader must have:
   - 2.1. Screenings hopper in the rear
   - 2.2. Belt conveyors that carry the screenings to the front
   - 2.3. Spreading hopper capable of providing a uniform screening spread rate over the entire width of the traffic lane in 1 application.
3. Self-propelled power brooms. Do not use gutter brooms or steel-tined brooms. Brooms must be capable of removing loose screenings adjacent to barriers that prevent screenings from being swept off the roadway, including curbs, gutters, dikes, berms, and railings.
4. Pneumatic-tired rollers. Pneumatic-tired rollers must be an oscillating type at least 4 feet wide. Each roller must be self-propelled and reversible. Pneumatic tires must be of equal size, diameter, type, and ply. The roller must carry at least 3,000 lb of load on each wheel and each tire must have an air pressure of 100 ± 5 psi.

37-2.01C(3) Surface Preparation

Before applying seal coat, cover manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured by tape or adhesive to the facility being covered. Reference the covered facilities with a sufficient number of control points to relocate the facilities after the application of the seal coat.

After completion of the seal coat operation, remove covers from the facilities.

Immediately before applying seal coat, clean the surface to receive seal coat by removing extraneous material and drying. Cleaning the existing pavement includes the use of brooms.

37-2.01C(4) Applying Emulsion and Asphalt Binder

Prevent spray on existing pavement not intended for seal coat or on previously applied seal coat using a material such as building paper. Remove the material after use.

Align longitudinal joints between seal coat applications with designated traffic lanes.

For emulsion, overlap longitudinal joints by not more than 4 inches. You may overlap longitudinal joints up to 8 inches if authorized.

For areas not accessible to a truck distributor bar, apply the emulsion with a squeegee or other authorized means. For asphalt binder, hand spray nonaccessible areas. You may overlap the emulsion or asphalt binder applications before the application of screenings at longitudinal joints.

Do not apply the emulsion or asphalt binder unless there are sufficient screenings at the job site to cover the emulsion or asphalt binder.

Discontinue application of emulsion or asphalt binder early enough to comply with lane closure specifications and darkness. Apply to 1 lane at a time and cover the lane entirely in 1 operation.

37-2.01C(5) Spreading Screenings

Prevent vehicles from driving on asphaltic emulsion or asphalt binder before spreading screenings.

Spread screenings at a uniform rate over the full lane width in 1 application.

Broom excess screenings at joints before spreading adjacent screenings.

Operate the spreader at speeds slow enough to prevent screenings from rolling over after dropping.

If the spreader is not moving, screenings must not drop. If you stop spreading and screenings drop, remove the excess screenings before resuming activities.

37-2.01C(6) Finishing

Remove piles, ridges, or unevenly distributed screenings. Repair permanent ridges, bumps, or depressions in the finished surface. Spread additional screenings and roll if screenings are picked up by rollers or vehicles.

Seal coat joints between adjacent applications of seal coat must be smooth, straight, uniform, and completely covered. Longitudinal joints must be at lane lines and not overlap by more than 4 inches. Blend the adjacent applications by brooming.

A coverage is the number of passes a roller needs to cover the width. A pass is 1 roller movement parallel to the seal coat application in either direction. Overlapping passes are part of the coverage being made and are not part of a subsequent coverage. Do not start a coverage until completing the previous coverage.

Before opening to traffic, finish seal coat in the following sequence:

1. Perform initial rolling consisting of 1 coverage with a pneumatic-tired roller
2. Perform final rolling consisting of 3 coverages with a pneumatic-tired roller
3. Broom excess screenings from the roadway and adjacent abutting areas
4. Apply flush coat if specified

The Engineer may order salvaging of excess screenings.

Dispose of excess screenings the Engineer determines are not salvageable. Dispose of screenings in any of the following ways or locations:

1. Under section 14-10
2. On embankment slopes
3. In authorized areas

Salvaging and stockpiling excess screenings is change order work.

37-2.01C(7) Seal Coat Maintenance

Seals coat surfaces must be maintained for 4 consecutive days from the day screenings are applied. Maintenance must include brooming to maintain a surface free of loose screenings, to distribute screenings over the surface so as to absorb any free asphaltic material, to cover any areas deficient in cover coat material, and to prevent formation of corrugations.

After 4 consecutive days, excess screenings must be removed from the paved areas. Brooming must not displace screenings set in asphaltic material.

The exact time of brooming will be determined by the Engineer. As a minimum, brooming will be required at the following times:

1. On 2-lane 2-way roadways, from 2 to 4 hours after traffic, controlled with pilot cars, has been routed on the seal coat
2. On multilane roadways, from 2 to 4 hours after screenings have been placed
3. In addition to previous brooming, immediately before opening any lane to public traffic, not controlled with pilot cars
4. On the morning following the application of screenings on any lane that has been open to public traffic not controlled with pilot cars and before starting any other activities

For 2-lane 2-way roadways under 1-way traffic control, upon completion of secondary rolling, public traffic must be controlled with pilot cars and routed over the new seal coat for a period of 2 to 4 hours. The Engineer will determine the exact period of time.

Schedule the operations so that seal coat is placed on both lanes of the traveled way each work shift and so that 1-way traffic control is discontinued 1 hour before darkness. At the end of the work shift, the end of the seal coat on both lanes must generally match.

On multilane roadways, initial brooming must begin after the screenings have been in place for a period of 2 to 4 hours. If the initial brooming is not completed during the work shift in which the screenings were placed, the initial brooming must be completed at the beginning of the next work shift.

Public traffic must be controlled with pilot cars and be routed on the new seal coat surface of the lane for a minimum of 2 hours after completion of the initial brooming and before opening the lane to traffic not controlled with pilot cars. When traffic is controlled with pilot cars, a maximum of 1 lane in the direction of travel must be open to public traffic. Once traffic controlled with pilot cars is routed over the seal coat at a particular location, continuous control must be maintained at that location until the seal coat placement and brooming on adjacent lanes to receive seal coat is completed.

37-2.01D Payment

If there is no bid item for a traffic control system, furnishing and using a pilot car is included in the various items of the work involved in applying the seal coat.

If test results for the screenings grading do not comply with specifications, you may remove the seal coat represented by these tests or request that it remain in place with a payment deduction. The deduction is $1.75 per ton for the screenings represented by the test results.

37-2.02 FOG SEAL

37-2.02A General

37-2.02A(1) Summary

Fog seal coat includes applying a slow-setting asphaltic emulsion.

37-2.02A(2) Definitions

Reserved

37-2.02A(3) Submittals

Submit a 1/2-gallon sample of the asphaltic emulsion in a plastic container. Take the sample from the distributor truck spray bar at mid-load.

37-2.02A(4) Quality Control and Assurance

Reserved

37-2.02B Material

The Engineer selects the grade of slow-setting asphaltic emulsion to be used.

If additional water is added to the asphaltic emulsion, the resultant mixture must not be more than 1 part asphaltic emulsion to 1 part water. The Engineer determines the exact amount of additional water.

37-2.02C Construction

Apply asphaltic emulsion for fog seal coat at a residual asphalt rate from 0.02 to 0.06 gal/sq yd. The Engineer determines the exact rate.

Apply fog seal coat when the ambient air temperature is above 40 degrees F.

Sprinkle water on fog seal coat that becomes tacky in an amount determined by the Engineer.

If fog seal coat and seal coat with screenings are specified on the same project, apply fog seal coat at least 4 days before applying the adjoining seal coat with screenings. The joint between the seal coats must be neat and uniform.

37-2.02D Payment

The Department does not adjust the unit price for an increase or decrease in the asphaltic emulsion (fog seal coat) quantity.

37-2.03 FLUSH COATS

37-2.03A General

Flush coat includes applying a fog seal coat to the surface of a seal coat, followed by sand.

37-2.03B Material

The Engineer selects the grade of slow-setting or quick-setting asphaltic emulsion to be used.

Sand for flush coat must comply with the material specifications for fine aggregate grading in section 90-1.02C(3). Sand must not include organic material or clay.

37-2.03C Construction

Apply asphaltic emulsion for flush coat at a residual asphalt rate from 0.02 to 0.06 gal/sq yd. The Engineer determines the exact rate.

During flush coat activities, close adjacent lanes to traffic. Do not track asphaltic emulsion on existing pavement surfaces.

Apply sand immediately after the asphaltic emulsion application.

Spread sand with a self-propelled screenings spreader equipped with a mechanical device that spreads sand at a uniform rate over the full width of a traffic lane in a single application. Spread sand at a rate from 2 to 6 lb/sq yd. The Engineer determines the exact rate.

37-2.03D Payment

The Department does not adjust the unit price for an increase or decrease in the sand cover for the flush coat quantity.

37-2.04 ASPHALTIC EMULSION SEAL COAT

37-2.04A General

37-2.04A(1) General

37-2.04A(1)(a) Summary

Section 37-2.04 includes specifictions for applying asphaltic emulsion seal coat. Asphaltic emulsion seal coat includes applying asphaltic emulsion, followed by screenings, and then a flush coat.

Asphaltic emulsion seal coat includes one or more of the following types:

1. Nonpolymer asphaltic emulsion seal coat
2. Polymer asphaltic emulsion seal coat

A double asphaltic emulsion seal coat is the application of asphaltic emulsion, followed by screenings applied twice in sequence.

37-2.04A(1)(b) Definitions

Reserved

37-2.04A(1)(c) Submittals

Submit a 1/2-gallon sample of asphaltic emulsion in a plastic container. Take the sample from the distributor truck spray bar at mid load.

At least 10 days before starting asphaltic emulsion seal coat application, submit the name of an authorized laboratory that will be performing asphaltic emulsion QC testing.

Submit a sample of asphaltic emulsion to the authorized laboratory and the Engineer. Each sample must be submitted in an insulated shipping container within 24 hours of sampling.

Within 7 days after taking samples, submit the authorized laboratory's test results for asphaltic emulsion.

37-2.04A(1)(d) Quality Control and Assurance

Samples for the screenings grading and cleanness value must be taken from the spreader conveyor belt.

Within 3 business days of sampling, the authorized laboratory must test asphaltic emulsion for:

1. Viscosity under AASHTO T 59
2. Sieve test under AASHTO T 59
3. Demulsibility under AASHTO T 59
4. Torsional recovery under California Test 332 for polymer asphaltic emulsion

Circulate polymer asphaltic emulsion in the distributor truck before sampling. Take samples from the distributor truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. Take two 1/2-gallon samples in the presence of the Engineer.

If test results for asphaltic emulsion are not in compliance with the specifications, you may request that the asphaltic emulsion seal coat represented by the tests remain in place with a payment deduction based on the pay factors.

37-2.04A(2) Materials

Not Used

37-2.04A(3) Construction

The Engineer determines the exact application rate.

At the time of application, the temperature of the asphaltic emulsion must be from 130 to 180 degrees F.

When tested under California Test 339, the application rate for asphaltic emulsion must not vary from the average by more than:

1. 15 percent in the transverse direction
2. 10 percent in the longitudinal direction

37-2.04A(4) Payment

Not Used

37-2.04B Nonpolymer Asphaltic Emulsion Seal Coat

37-2.04B(1) General

37-2.04B(1)(a) Summary

Section 37-2.04B includes specifications for applying a nonpolymer asphaltic emulsion seal coat.

37-2.04B(1)(b) Definitions

Reserved

37-2.04B(1)(c) Submittals

Reserved

37-2.04B(1)(d) Quality Control and Assurance

For nonpolymer asphaltic emulsion seal coat, if a test result for the screenings cleanness value is from 75 to 80, you may request that the asphaltic emulsion seal coat represented by the test remain in place. A payment deduction is made as specified in section 37-2.04D. If the screenings cleanness value is less than 75, remove the asphaltic emulsion seal coat.

37-2.04B(2) Materials

Screenings for nonpolymer asphaltic emulsion seal coat must have the gradation as determined under California Test 202 in the following table.

Nonpolymer Asphaltic Emulsion Seal Coat Screenings Gradation

	Percentage passing			
Sieve sizes	Coarse 1/2" max	Medium 3/8" max	Medium fine 5/16" max	Fine 1/4" max
3/4"	100	--	--	--
1/2"	95–100	100	--	--
3/8"	50–80	90–100	100	100
No. 4	0–15	5–30	30–60	60–85
No. 8	0–5	0–10	0–15	0–25
No. 16	--	0–5	0–5	0–5
No. 30	--	--	0–3	0–3
No. 200	0–2	0–2	0–2	0–2

The cleanness value determined under California Test 227 must be 80.

37-2.04B(3) Construction

Asphaltic emulsion must be applied within the application rate ranges shown in the following table:

Asphaltic Emulsion Application Rates

Screenings	Application rate range(gallons per square yard)
Fine	0.15–0.30
Medium fine	0.25–0.35
Medium	0.25–0.40
Coarse	0.30–0.40

Apply asphaltic emulsion when the ambient air temperature is from 65 to 110 degrees F and the pavement surface temperature is at least 80 degrees F.

Do not apply asphaltic emulsion when weather forecasts predict the ambient air temperature will fall below 39 degrees F within 24 hours after application.

For double asphaltic emulsion seal coat, the asphaltic emulsion must be applied within the application rates shown in the following table:

Asphaltic Emulsion Application Rates

Screenings	Application rate range (gal/sq yd)
Double	
1st application	0.20–0.35
2nd application	0.20–0.30

You may stockpile screenings for asphaltic emulsion seal coat if you prevent contamination. Screenings must have damp surfaces at spreading. If water visibly separates from the screenings, do not spread. You may redampen them in the delivery vehicle.

Spread screenings before the asphaltic emulsion sets or breaks.

Spread screenings within 10 percent of the rate determined by the Engineer. Screenings must have a spread rate within the ranges shown in the following table:

Screening Spread Rates

Seal coat type	Range (lb/sq yd)
Fine	12–20
Medium fine	16–25
Medium	20–30
Coarse	23–30

Do not spread screenings more than 2,500 feet ahead of the completed initial rolling.

For double asphaltic emulsion seal coat, screenings must have a spread rate within the ranges shown in the following table:

Screening Spread Rates

Seal coat type	Range (lb/sq yd)
Double	
1st application	23–30
2nd application	12–20

Remove excess screenings on the 1st application before the 2nd application of asphaltic emulsion.

37-2.04B(4) Payment

If asphaltic emulsion seal coat with screenings does not comply with the cleanness value specifications, you may request that the seal coat remain in place with a pay deduction corresponding to the cleanness value shown in the following table:

Asphaltic Emulsion Seal Coat Cleanness Value Deductions

Cleanness value	Deduction
80 or over	None
79	$2.00 /ton
77–78	$4.00 /ton
75–76	$6.00 /ton

37-2.04C Polymer Asphaltic Emulsion Seal Coat

37-2.04C(1) General

37-2.04C(1)(a) Summary

Section 37-2.04C includes specifications for applying a polymer asphaltic emulsion seal coat.

37-2.04C(1)(b) Definitions

Reserved

37-2.04C(1)(c) Submittals

At least 10 days before starting polymer asphaltic emulsion seal coat application, submit a signed copy of the test result report of the Vialit test method for aggregate retention in chip seals (french chip) to the Engineer and to:

DEPARTMENT OF TRANSPORTATION
Division of Maintenance, Roadway Maintenance Office
1120 N Street, MS 31
Sacramento, CA 95814

37-2.04C(1)(d) Quality Control and Assurance

The authorized laboratory must test screenings for retention under the Vialit test method for aggregate in chip seals (french chip). The Vialit test results are not used for acceptance. The Vialit test is available at the METS Web site.

If the test results for polymer asphaltic emulsion do not comply with the specifications, the Engineer assesses a pay factor value for the following properties and increments:

Polymer Asphaltic Emulsion Pay Factor Table

Test method and property	Increment	Pay factor
Test on polymer asphaltic emulsion		
AASHTO T 59 (Viscosity, sec Saybolt Furol, at 50 °C)	Each 10 seconds above max or below min	1
AASHTO T 59 (settlement, 5 days, percent)	Each 1.5 percent above max	1
AASHTO T 59 (sieve test, percent max)	Each 0.2 percent above max	1
AASHTO T 59 (demulsibility percent)	Each 2 percent below min	1
Test on residue from evaporation test		
AASHTO T 49 (penetration, 25 °C)	Each 2 dm above max or below min	1
ASTM D 36 (field softening point °C)	2 °C below min	1
California Test 332 (torsional recovery [a])	For each 1 increment below the min value of 18	1
	For each 2 increments below the min value of 18	3
	For each 3 or more increments below the min value of 18	10

[a] The highest pay factor applies

The Engineer assesses a pay factor of 1 for sampling not performed in compliance with the specifications, including shipping and sampling containers.

For polymer asphaltic emulsion seal coat, if a test result for the screenings cleanness value is from 75 to 86, you may request that the asphaltic emulsion seal coat represented by the test remain in place. A payment deduction is made as specified in section 37-2.04D. If the screenings cleanness value is less than 75, remove the asphaltic emulsion seal coat.

37-2.04C(2) Materials

Polymer asphaltic emulsion must include elastomeric polymer.

Polymer asphaltic emulsion must comply with section 94, Table 3, under the test on residue from evaporation test for Grades PMRS2, PMRS2h, PMCRS2, and PMCRS2h and the following:

1. The penetration at 39.2 degrees F (200g for 60 seconds) determined under AASHTO T 49 must be at least 6.
2. Test elastic recovery under AASHTO T 301.
3. Polymer content in percent by weight does not apply.
4. The minimum ring and ball softening point temperature determined under AASHTO T 53 for Test on Residue from Evaporation Test must comply with the following:
   - 4.1. 126 degrees F for a geographical ambient temperature from 32 to 104 degrees F
   - 4.2. 129 degrees F for a geographical ambient temperature from 18 to 104 degrees F
   - 4.3. 135 degrees F for a geographical ambient temperature from 18 to greater than 104 degrees F

Screenings for polymer asphaltic emulsion seal coat must have the gradation as determined under California Test 202 in the following table:

Polymer Asphaltic Emulsion Seal Coat Screenings Gradation

	Percentage passing			
Sieve sizes	Coarse 1/2" max	Medium 3/8" max	Medium fine 5/16" max	Fine 1/4" max
3/4"	100	--	--	--
1/2"	85–100	100	--	--
3/8"	0–30	85–100	100	100
No. 4	0–5	0–15	0–50	60–85
No. 8	--	0–5	0–15	0–25
No. 16	--	--	0–5	0–5
No. 30	--	--	0–3	0–3
No. 200	0–2	0–2	0–2	0–2

The cleanness value determined under California Test 227 must be 86.

37-2.04C(3) Construction

Polymer asphaltic emulsion must be applied within the application rate ranges shown in the following table:

Polymer Asphaltic Emulsion Application Rates

Screenings	Application rate range(gallons per square yard)
Fine	0.15–0.30
Medium fine	0.25–0.35
Medium	0.25–0.40
Coarse	0.30–0.40

The Engineer determines the exact application rate.

At the time of application, the temperature of polymer asphaltic emulsion must be from 130 to 180 degrees F.

Apply polymer asphaltic emulsion when the ambient air temperature is from 60 to 105 degrees F and the pavement surface temperature is at least 55 degrees F.

Do not apply polymer asphaltic emulsion when weather forecasts predict the ambient air temperature will fall below 39 degrees F within 24 hours after application.

When tested under California Test 339, the application rate for polymer asphaltic emulsion must not vary from the average by more than:

1. 15 percent in the transverse direction
2. 10 percent in the longitudinal direction

For double asphaltic emulsion seal coat, polymer asphaltic emulsion must be applied within the application rates shown in the following table:

Polymer Asphaltic Emulsion Application Rates

Screenings	Application rate range (gal/sq yd)
Double	
1st application	0.20–0.35
2nd application	0.20–0.30

You may stockpile screenings for polymer emulsion seal coat if you prevent contamination. Screenings must have damp surfaces at spreading. If water visibly separates from the screenings, do not spread. You may redampen them in the delivery vehicle.

Spread screenings before the polymer emulsion sets or breaks.

Spread screenings within 10 percent of the rate determined by the Engineer. Screenings must have a spread rate within the ranges shown in the following table:

Screening Spread Rates

Seal coat type	Range (lb/sq yd)
Fine	12–20
Medium fine	16–25
Medium	20–30
Coarse	23–30

Do not spread screenings more than 2,500 feet ahead of the completed initial rolling.

For double seal coat, screenings must have a spread rate within the ranges shown in the following table:

Screening Spread Rates

Seal coat type	Range (lb/sq yd)
Double	
1st application	23–30
2nd application	12–20

Remove excess screenings on the 1st application before the 2nd application of asphaltic emulsion.

37-2.04C(4) Payment

If polymer asphaltic emulsion seal coat with screenings does not comply with the specifications for cleanness value you may request that the seal coat remain in place with a pay deduction corresponding by the cleanness value shown in the following table:

Polymer Asphaltic Emulsion Seal Coat Cleanness Value Deductions

Cleanness value	Deduction
86 or over	None
81–85	$2.20/ton
77–80	$4.40/ton
75–76	$6.60/ton

If test results for polymer asphaltic emulsion aggregate grading and cleanness value test results do not comply with the specifications, all deductions are made. A test for polymer asphaltic emulsion represents the smaller of 55 tons or 1 day's production. A test for the screenings grading or cleanness value represents the smaller of 300 tons or 1 day's production.

The payment deduction for noncompliant polymer asphaltic emulsion is based on the total pay factor value determined from the table titled, "Polymer Asphaltic Emulsion Pay Factor Deduction." You must remove polymer asphaltic emulsion seal coat with a pay factor value greater than 20. You may request seal coat with noncompliant polymer asphaltic emulsion to remain in place with a pay deduction for the total pay factor value shown in the following table:

Polymer Asphaltic Emulsion Pay Factor Deductions

Total pay factor value	Deduction
0	none
1–2	$5.00/ton
3–5	$10.00/ton
6–9	$15.00/ton
10–14	$25.00/ton
15–20	$50.00/ton

37-2.05 ASPHALT BINDER SEAL COATS

37-2.05A General

Reserved

37-2.05B Asphalt Rubber Binder Seal Coats

37-2.05B(1) General

37-2.05B(1)(a) Summary

Section 37-2.05B includes specifications for applying asphalt rubber binder seal coat. Asphalt rubber seal coat includes applying heated asphalt rubber binder, followed by heated screenings precoated with asphalt binder, followed by a flush coat.

37-2.05B(1)(b) Definitions

crumb rubber modifier: Ground or granulated high natural crumb rubber or scrap tire crumb rubber.

descending viscosity reading: Subsequent viscosity reading at least 5 percent lower than the previous viscosity reading.

high natural crumb rubber: Material containing 40 to 48 percent natural rubber.

scrap tire crumb rubber: Any combination of:

1. Automobile tires
2. Truck tires
3. Tire buffing

37-2.05B(1)(c) Submittals

For each delivery of asphalt rubber binder ingredients and asphalt rubber binder to the job site, submit a certificate of compliance and a copy of the specified test results.

Submit MSDS for each asphalt rubber binder ingredient and the asphalt rubber binder.

At least 15 days before use, submit:

1. Four 1-quart cans of mixed asphalt rubber binder
2. Samples of each asphalt rubber binder ingredient
3. Asphalt rubber binder formulation and data as follows:
   - 3.1. For asphalt binder and asphalt modifier submit:
     - 3.1.1. Source and grade of asphalt binder
     - 3.1.2. Source and type of asphalt modifier
     - 3.1.3. Percentage of asphalt modifier by weight of asphalt binder
     - 3.1.4. Percentage of combined asphalt binder and asphalt modifier by weight of asphalt rubber binder
     - 3.1.5. Test results for the specified quality characteristics
   - 3.2. For crumb rubber modifier submit:
     - 3.2.1. Each source and type of scrap tire crumb rubber and high natural rubber
     - 3.2.2. Percentage of scrap tire crumb rubber and high natural rubber by total weight of asphalt rubber binder
     - 3.2.3. Test results for the specified quality characteristics
   - 3.3. For asphalt rubber binder submit:
     - 3.3.1. Test results for the specified quality characteristics
     - 3.3.2. Minimum reaction time and temperature

At least 5 business days before use, submit the permit issued by the local air quality agency for asphalt rubber binder:

1. Field blending equipment
2. Application equipment

If an air quality permit is not required by the local air quality agency for producing asphalt rubber binder or spray applying asphalt rubber binder, submit verification from the local air quality agency that an air quality permit is not required for this Contract.

Submit a certified volume or weight slip for each delivery of asphalt rubber binder ingredients and asphalt rubber binder.

Submit a certificate of compliance and accuracy verification of test results for viscometers.

When determined by the Engineer, submit notification 15 minutes before each viscosity test or submit a schedule of testing times.

Submit the log of asphalt rubber binder viscosity test results each day of asphalt rubber seal coat work.

37-2.05B(1)(d) Quality Control and Assurance

Equipment used in producing asphalt rubber binder must be permitted for use by the local air quality agency. Equipment used in spreading asphalt rubber binder must be permitted for use by the local air quality agency.

Each asphalt rubber binder ingredient must be sampled and tested for compliance with the specifications by the manufacturer.

Test and submit results at least once per project or the following, whichever frequency is greater:

1. For crumb rubber modifier except for grading, at least once per 250 tons. Samples of scrap tire crumb rubber and high natural crumb rubber must be sampled and tested separately. Test each delivery of crumb rubber modifier for grading.
2. For asphalt binder, test and submit at least once per 200 tons of asphalt binder production.
3. For asphalt modifier, test and submit at least once per 25 tons of asphalt modifier production.

Scrap tire crumb rubber and high natural crumb rubber must be delivered to the asphalt rubber production site in separate bags.

Take viscosity readings of asphalt rubber binder under ASTM D7741 during asphalt rubber binder production. Start taking viscosity readings of samples taken from the reaction vessel 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 meets the specification requirement. After meeting the 2 descending viscosity readings requirement, continue to take viscosity readings hourly and within 15 minutes before use. Log the test results, including time of testing and temperature of the asphalt rubber binder.

37-2.05B(2) Material

37-2.05B(2)(a) General

Reserved

37-2.05B(2)(b) Asphalt Binder

Asphalt binder must comply with the specifications for asphalt binder. Do not modify asphalt binder with polymer.

37-2.05B(2)(c) Asphalt Modifier

Asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon. Asphalt modifier must have the values for the quality characteristics shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Value
Viscosity, m^2/s (x 10^{-6}) at 100 °C	ASTM D 445	X ± 3 [a]
Flash point, CL.O.C., °C	ASTM D 92	207 min
Molecular analysis		
Asphaltenes, percent by mass	ASTM D 2007	0.1 max
Aromatics, percent by mass	ASTM D 2007	55 min

[a] "X" denotes the proposed asphalt modifier viscosity from 19 to 36. A change in "X" requires a new asphalt rubber binder submittal.

37-2.05B(2)(d) Crumb Rubber Modifier

Crumb rubber modifier must be ground or granulated at ambient temperature.

Scrap tire crumb rubber and high natural crumb rubber must be delivered to the asphalt rubber binder production site in separate bags.

Steel and fiber must be separated. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. Cryogenically-produced crumb rubber modifier particles must be large enough to be ground or granulated.

Wire must not be more than 0.01 percent by weight of crumb rubber modifier. Crumb rubber modifier must be free of contaminants except fabric, which must not exceed 0.05 percent by weight of crumb rubber modifier. Method for determining the percent weight of wire and fabric is available under Laboratory Procedure 10 at the following METS Web site:

http://www.dot.ca.gov/hq/esc/Translab/ofpm/fpmlab.htm

The length of an individual crumb rubber modifier particle must not exceed 3/16 inch.

Crumb rubber modifier must be dry, free-flowing particles that do not stick together. A maximum of 3 percent calcium carbonate or talc by weight of crumb rubber modifier may be added. Crumb rubber modifier must not cause foaming when combined with the asphalt binder and asphalt modifier.

Specific gravity of crumb rubber modifier must be from 1.1 to 1.2 determined under California Test 208.

When tested under ASTM D 297, crumb rubber modifier must comply with the requirements shown in the following table:

Crumb Rubber Modifier

Quality characteristic	Scrap tire crumb rubber (percent)		High natural rubber (percent)	
	Min	Max	Min	Max
Acetone extract	6.0	16.0	4.0	16.0
Rubber hydrocarbon	42.0	65.0	50.0	--
Natural rubber content	22.0	39.0	40.0	48.0
Carbon black content	28.0	38.0	--	--
Ash content	--	8.0	--	--

Scrap tire crumb rubber must have the gradation shown in the following table:

Scrap Tire Crumb Rubber Gradation
Percentage passing

Sieve size	Gradation limit	Operating range	Contract compliance
No. 8	100	100	100
No. 10	98–100	95–100	90–100
No. 16	45–75	35–85	32–88
No. 30	2–20	2–25	1–30
No. 50	0–6	0–10	0–15
No. 100	0–2	0–5	0–10
No. 200	0	0–2	0–5

High natural crumb rubber must have the gradation shown in the following table:

High Natural Crumb Rubber Gradation
Percentage passing

Sieve size	Gradation limit	Operating range	Contract compliance
No. 10	100	100	100
No. 16	95–100	92–100	85–100
No. 30	35–85	25–95	20–98
No. 50	10–30	6–35	2–40
No. 100	0–4	0–7	0–10
No. 200	0–1	0–3	0–5

Test the crumb rubber modifier gradation under ASTM C 136 except

1. Split or quarter 100 ± 5 g from the crumb rubber modifier sample and dry to a constant mass at a temperature from 57 to 63 degrees C and record the dry sample mass. Place the crumb rubber modifier sample and 5 g of talc in a 1/2-liter jar. Seal the jar, then shake the jar by hand for at least 1 minute to mix the crumb rubber modifier and the talc. Continue shaking or open the jar and stir until the particle agglomerates and clumps are broken and the talc is uniformly mixed.
2. Place 1 rubber ball on each sieve. Each ball must weigh 8.5 ± 0.5 g, measure 24.5 ± 0.5 mm in diameter, and have a Shore Durometer "A" hardness of 50 ± 5 determined under ASTM D 2240. After sieving the combined material for 10 ± 1 minutes, disassemble the sieves. Brush material adhering to the bottom of a sieve into the next finer sieve. Weigh and record the mass of the material retained on the 2.36-milimeter sieve and leave this material (do not discard) on the scale or balance. Fabric balls must remain on the scale or balance and be placed together on the side to prevent them from being covered or disturbed when the material from finer sieves is placed onto the scale or balance. The material retained on the 2.00-milimeter sieve must be added to the scale or balance. Weigh and record that mass as the accumulative mass retained on the 2.00-milimeter sieve. Continue weighing and recording the accumulated masses retained on the remaining sieves until the accumulated mass retained in the pan has been determined. Before discarding the crumb rubber modifier sample, separately weigh and record the total mass of fabric balls in the sample.
3. Determine the mass of material passing the 75-micrometer sieve by subtracting the accumulated mass retained on the 75-micrometer sieve from the accumulated mass retained in the pan. If the material passing the 75-micrometer sieve has a mass of 5 g or less, cross out the recorded number for the accumulated mass retained in the pan and copy the number recorded for the accumulated mass retained on the 75-micrometer sieve and record that number, next to the crossed out number, as the accumulated mass retained in the pan. If the material passing the 75-micrometer sieve has a mass greater than 5 g, cross out the recorded number for the accumulated mass retained in the pan, subtract 5 g from that number and record the difference next to the crossed out number. The adjustment to the accumulated mass retained in the pan accounts for the 5 g of talc added to the sample. For calculation purposes, the adjusted total sample mass is the same as the adjusted

accumulated mass retained in the pan. Determine the percent passing based on the adjusted total sample mass and record to the nearest 0.1 percent.

37-2.05B(2)(e) Asphalt Rubber Binder

Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier

Asphalt rubber binder blending equipment must be authorized under the Department's material plant quality program.

The blending equipment must allow the determination of weight percentages of each asphalt rubber binder ingredient.

Asphalt rubber binder must be 79 ± 1 percent by weight asphalt binder and 21 ± 1 percent by weight of crumb rubber modifier. The minimum percentage of crumb rubber modifier must be 20.0 percent and lower values may not be rounded up.

Crumb rubber modifier must be 76 ± 2 percent by weight scrap tire crumb rubber and 24 ± 2 percent by weight high natural rubber.

Asphalt modifier and asphalt binder must be blended at the production site. Asphalt modifier must be from 2.5 to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder. The asphalt rubber binder supplier determines the exact percentage.

If blended, the asphalt binder must be from 375 to 440 degrees F when asphalt modifier is added and the mixture must circulate for at least 20 minutes. Asphalt binder, asphalt modifier, and crumb rubber modifier may be proportioned and combined simultaneously.

The blend of asphalt binder and asphalt modifier must be combined with crumb rubber modifier at the asphalt rubber binder production site. The asphalt binder and asphalt modifier blend must be from 375 to 440 degrees F when crumb rubber modifier is added. Combined ingredients must be allowed to react at least 45 minutes at temperatures from 375 to 425 degrees F except the temperature must be at least 10 degrees F below the flash point of the asphalt rubber binder.

After reacting, the asphalt rubber binder must have the values for the quality characteristics shown in the following table:

Asphalt Rubber Binder

Quality characteristic	Test method	Requirement	
		Min	Max
Cone penetration @ 25 °C, 1/10 mm	ASTM D 217	25	60
Resilience @ 25 °C, percent rebound	ASTM D 5329	18	50
Field softening point, °C	ASTM D 36	55	88
Viscosity @190 °C, Pa • s ($x10^{-3}$)	ASTM D 7741	1500	2500

Maintain asphalt rubber binder at a temperature from 375 to 415 degrees F.

Stop heating unused asphalt rubber binder 4 hours after the 45-minute reaction period. Reheating asphalt rubber binder that cools below 375 degrees F is a reheat cycle. Do not exceed 2 reheat cycles. If reheating, asphalt rubber binder must be from 375 to 415 degrees F before use.

During reheating, you may add scrap tire crumb rubber. Scrap tire crumb rubber must not exceed 10 percent by weight of the asphalt rubber binder. Allow added scrap tire crumb rubber to react for at least 45 minutes. Reheated asphalt rubber binder must comply with the specifications for asphalt rubber binder.

37-2.05B(2)(f) Screenings

Before precoating with asphalt binder and when tested under California Test 202, screenings for asphalt rubber seal coat must have the gradation shown in the following table:

Asphalt Rubber Seal Coat Screenings Gradation

Sieve sizes	Percentage passing by weight		
	Coarse 1/2" max	Medium 1/2" max	Fine 3/8" max
3/4"	100	100	100
1/2"	75–90	85–90	95–100
3/8"	0–20	0–30	70–85
No. 4	0–2	0–5	0–15
No. 8	--	--	0–5
No. 200	0–1	0–1	0–1

Screenings must have the values for the properties shown in the following table:

Seal Coat Screenings

Properties	Test method	Value
Cleanness value, min	California Test 227	80
Durability, min	California Test 229	52

37-2.05B(3) Construction

37-2.05B(3)(a) General

Reserved

37-2.05B(3)(b) Equipment

Self-propelled distributor truck for applying asphalt rubber binder must have the following features:

1. Heating unit
2. Internal mixing unit
3. Pumps that spray asphalt rubber binder within 0.05 gal/sq yd of the specified rate
4. Fully circulating spray bar that applies asphalt rubber binder uniformly
5. Tachometer
6. Pressure gages
7. Volume measuring devices
8. Thermometer
9. Observation platform on the rear of the truck for an observer on the platform to see the nozzles and unplug them if needed

37-2.05B(3)(c) Precoating Screenings

For asphalt rubber seal coat, do not recombine fine materials collected in dust control systems except cyclone collectors or knock-out boxes with any other aggregate used in the production of screenings.

For asphalt rubber seal coat, screenings must be preheated from 260 to 325 degrees F. Coat with any of the asphalts specified in the table titled "Performance Graded Asphalt Binder" in section 92. Coat at a central mixing plant. The asphalt must be from 0.5 to 1.0 percent by weight of dry screenings. The Engineer determines the exact rate.

Plant must be authorized under the Department's material plant quality program.

Do not stockpile preheated or precoated screenings.

37-2.05B(3)(d) Asphalt Rubber Binder Application

Apply asphalt rubber binder immediately after the reaction period. At the time of application, the temperature of asphalt rubber binder must be from 385 to 415 degrees F.

Apply asphalt rubber binder at a rate from 0.55 to 0.65 gal/sq yd. The Engineer determines the exact rate.

Apply asphalt rubber binder when the atmospheric temperature is from 60 to 105 degrees F and the pavement surface temperature is at least 55 degrees F.

Do not apply asphalt rubber binder unless there are sufficient screenings available to cover the asphalt rubber binder within 2 minutes. Intersections, turn lanes, gore points, and irregular areas must be covered within 15 minutes.

Do not apply asphalt rubber binder when weather or road conditions are unsuitable, including high wind or when the pavement is damp. In windy conditions you may adjust the distributor bar height and distribution speed, and use shielding equipment, if the Engineer authorizes your request.

37-2.05B(3)(e) Screenings Application

During transit, cover precoated screenings for asphalt rubber seal coat with tarpaulins if the ambient air temperature is below 65 degrees F or the haul time exceeds 30 minutes.

At the time of application, screenings for asphalt rubber seal coat must be from 225 to 325 degrees F.

Spread screenings at a rate from 28 to 40 lb/sq yd. The exact rate is determined by the Engineer. Spread to within 10 percent of the determined rate.

37-2.05B(3)(f) Rolling and Sweeping

Perform initial rolling within 90 seconds of spreading screenings. Do not spread screenings more than 200 feet ahead of the initial rolling.

For final rolling, you may request use of a steel-wheeled roller weighing from 8 to 10 tons, static mode only.

Perform a final sweeping before Contract acceptance. The final sweeping must not dislodge screenings.

Dispose of swept screenings at least 150 feet from any waterway.

37-2.05B(4) Payment

Screenings for asphalt rubber seal coat are measured by coated weight after they are preheated and precoated with asphalt binder. The weight of screenings must be the coated weight.

If recorded batch weights are printed automatically, the bid item for screenings for asphalt-rubber seal coat are measured using the printed batch weights, provided:

1. Total aggregate weight for screenings per batch is printed
2. Total asphalt binder weight per batch is printed
3. Each truckload's zero tolerance weight is printed before weighing the first batch and after weighing the last batch
4. Time, date, mix number, load number and truck identification are correlated with a load slip
5. A copy of the recorded batch weights is certified by a licensed weighmaster and submitted to the Engineer

Screenings for asphalt rubber seal coat is paid for as precoated screenings.

Asphalt-rubber binder is measured under the specifications for asphalts.

If test results for gradation tests do not comply with the specifications, deductions are taken.

Each gradation test for scrap tire crumb rubber represents 10,000 lbs or the amount used in that day's production, whichever is less.

Each gradation test for high natural rubber represents 3,400 lbs or the amount used in that day's production, whichever is less.

For each gradation test, the following pay deductions will be taken from the asphalt rubber bid item:

Gradation Test

Material	Test result [a]	Deduction
Scrap tire crumb rubber	Operating range < TR < Contract compliance	$250
Scrap tire crumb rubber	TR > Contract compliance	$1,100
High natural crumb rubber	Operating range < TR < Contract compliance	$250
High natural crumb rubber	TR > Contract compliance	$600

[a] Test Result = TR

37-2.05C Modified Asphalt Binder Seal Coat

Reserved

37-2.06–37-2.10 RESERVED

Add to section 37-3.01D(1):

01-18-13

Micro-surfacing spreader operators must attend the prepaving conference.

^^

39 HOT MIX ASPHALT

07-19-13

Add to section 39-1.01B:

02-22-13

processed RAP: RAP that has been fractionated.

substitution rate: Amount of RAP aggregate substituted for virgin aggregate in percent.

binder replacement: Amount of RAP binder in OBC in percent.

surface course: Upper 0.2 feet of HMA exclusive of OGFC.

Add to the end of the paragraph in section 39-1.02A:

10-19-12

as shown

Replace "less than 10 percent" in note "b" in the table in the 5th paragraph of section 39-1.02E with:

01-20-12

10 percent or less

Replace the paragraphs in section 39-1.02F with:

02-22-13

39-1.02F(1) General

You may produce HMA Type A or B using RAP. HMA produced using RAP must comply with the specifications for HMA, except aggregate quality specifications do not apply to RAP. You may substitute

RAP at a substitution rate not exceeding 25 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the JMF submittal. The JMF must include the percent of RAP used.

Provide enough space for meeting RAP handling requirements at your facility. Provide a clean, graded, well-drained area for stockpiles. Prevent material contamination and segregation.

If RAP is from multiple sources, blend the RAP thoroughly and completely. RAP stockpiles must be homogeneous.

Isolate the processed RAP stockpiles from other materials. Store processed RAP in conical or longitudinal stockpiles. Processed RAP must not be agglomerated or be allowed to congeal in large stockpiles.

AASHTO T 324 (Modified) is AASHTO T 324, "Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)," with the following parameters:

07-19-13

1. Target air voids must equal 7 ± 1 percent
2. Specimen height must be 60 mm ± 1mm
3. Number of test specimens must be 4
4. Test specimen must be a 150mm gyratory compacted specimen
5. Test temperature must be set at:
   5.1. 122 ± 2 degrees F for PG 58
   5.2. 131 ± 2 degrees F for PG 64
   5.3. 140 ± 2 degrees F for PG 70 and above
6. Measurements for impression must be taken at every 100 passes
7. Inflection point defined as the number of wheel passes at the intersection of the creep slope and the stripping slope
8. Testing shut off must be set at 25,000 passes

02-22-13

39-1.02F(2) Substitution Rate of 15 Percent or Less

For a RAP substitution rate of 15 percent or less, you may stockpile RAP during the entire project.

39-1.02F(3) Substitution Rate Greater than 15 Percent

07-19-13

For a RAP substitution rate greater than 15 percent, fractionate RAP into 2 sizes, a coarse fraction RAP retained on 3/8-inch screen and a fine fraction RAP passing 3/8-inch screen.

Sample and test processed RAP at a minimum frequency of 1 sample per 1000 tons with a minimum of 6 samples for each processed RAP stockpile. If a processed RAP stockpile is augmented, sample and test processed RAP quality characteristics at a minimum frequency of 1 sample per 500 tons of augmented RAP.

When tested under California Test 202 with a total mechanical shaking time of 10 minutes ±15 seconds, the processed RAP must meet the grading requirements shown in the following table:

Processed RAP Gradation
(Percentage Passing)

Sieve sizes	TV limits	Allowable tolerance
1/2"	100	--
3/8"	97	TV + 3

02-22-13

The processed RAP asphalt binder content must be within ± 2.0 percent of the average processed RAP stockpile asphalt binder content when tested under ASTM D 2172, Method B. If a new processed RAP stockpile is required, the average binder content of the new processed RAP stockpile must be within ± 2.0 percent of the average binder content of the original processed RAP stockpile.

The maximum specific gravity for processed RAP must be within ± 0.06 when tested under California Test 309 of the average maximum specific gravity reported on page 4 of your *Contractor Hot Mix Asphalt Design Data* form.

Replace items 7 and 8 in the 5th paragraph of section 39-1.03A with:

02-22-13

7. Substitution rate by more than 5 percent if your assigned RAP substitution rate is 15 percent or less
8. Substitution rate by more than 3 percent if your assigned RAP substitution rate is greater than 15 percent
9. Average binder content by more than 2 percent from the average binder content of the original processed RAP stockpile used in the mix design
10. Maximum specific gravity of processed RAP by more than ±0.060 from the average maximum specific gravity of processed RAP reported on page 4 of your *Contractor Hot Mix Asphalt Design Data* form
11. Any material in the JMF

Replace the 1st paragraph of section 39-1.03B with:

02-22-13

Perform a mix design that produces HMA with the values for the quality characteristics shown in the following table:

HMA Mix Design Requirements

Quality characteristic	Test method	HMA type		
		A	B	RHMA-G
Air void content (%)	California Test 367	4.0	4.0	Section 39-1.03B
Voids in mineral aggregate (% min.)	California Test 367			
No. 4 grading		17.0	17.0	--
3/8" grading		15.0	15.0	--
1/2" grading		14.0	14.0	18.0–23.0
3/4" grading		13.0	13.0	18.0–23.0
Voids filled with asphalt (%)	California Test 367			Note a
No. 4 grading		65.0–75.0	65.0–75.0	
3/8" grading		65.0–75.0	65.0–75.0	
1/2" grading		65.0–75.0	65.0–75.0	
3/4" grading		65.0–75.0	65.0–75.0	
Dust proportion	California Test 367			Note a
No. 4 and 3/8" gradings		0.6–1.2	0.6–1.2	
1/2" and 3/4" gradings		0.6–1.2	0.6–1.2	
Stabilometer value (min.)	California Test 366			
No. 4 and 3/8" gradings		30	30	--
1/2" and 3/4" gradings		37	35	23

[a] Report this value in the JMF submittal.

For RAP substitution rate greater than 15 percent, the mix design must comply with the additional quality characteristics shown in the following table:

Additional HMA Mix Design Requirements
for RAP Substitution Rate Greater Than 15 Percent

Quality characteristic	Test method	HMA type		
		A	B	RHMA-G
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)	AASHTO T 324 (Modified)[a]			
PG-58		10,000	10,000	--
PG-64		15,000	15,000	
PG-70		20,000	20,000	
PG-76 or higher		25,000	25,000	
Hamburg wheel track (inflection point minimum number of passes)	AASHTO T 324 (Modified)[a]			
PG-58		10,000	10,000	--
PG-64		10,000	10,000	
PG-70		12,500	12,500	
PG-76 or higher		15000	15000	
Moisture susceptibility (minimum dry strength, psi)	California Test 371[a]	120	120	--
Moisture susceptibility (tensile strength ration, %)	California Test 371[a]	70	70	--

[a]Test plant produced HMA.

For HMA with RAP, the maximum binder replacement must be 25.0 percent of OBC for surface course and 40.0 percent of OBC for lower courses.

For HMA with a binder replacement less than or equal to 25 percent of OBC, you may request that the PG asphalt binder grade with upper and lower temperature classifications be reduced by 6 degrees C from the specified grade.

For HMA with a binder replacement greater than 25 percent but less than or equal to 40 percent of OBC, you must use a PG asphalt binder grade with upper and lower temperature classifications reduced by 6 degrees C from the specified grade.

Replace item 4 in the list in the 1st paragraph of section 39-1.03C with:

01-20-12

4. JMF renewal on a *Caltrans Job Mix Formula Renewal* form, if applicable

Add to the end of section 39-1.03C:

02-22-13

For RAP substitution rate greater than 15 percent, submit with the JMF submittal:

1. California Test 371 tensile strength ratio and minimum dry strength test results
2. AASHTO T 324 (Modified) test results

For RAP substitution rate greater than 15 percent, submit California Test 371 and AASHTO T 324 (Modified) test results to the Engineer and to:

Moisture_Tests@dot.ca.gov

Replace the 2nd paragraph of section 39-1.03E with:

04-20-12

Use the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form. No adjustments to asphalt binder content are allowed. Based on your testing and production experience, you may submit an adjusted aggregate gradation TV on a *Contractor Job Mix Formula Proposal* form before verification testing. Aggregate gradation TV must be within the TV limits specified in the aggregate gradation tables.

Add between the 3rd and 4th paragraphs of section 39-1.03E:

04-20-12

Asphalt binder set point for HMA must be the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form. When RAP is used, asphalt binder set point for HMA must be:

$$\text{Asphalt Binder Set Point} = \frac{\dfrac{BC_{OBC}}{\left(1 - \dfrac{BC_{OBC}}{100}\right)} - R_{RAP}\left[\dfrac{BC_{RAP}}{\left(1 - \dfrac{BC_{RAP}}{100}\right)}\right]}{100 + \dfrac{BC_{OBC}}{\left(1 - \dfrac{BC_{OBC}}{100}\right)}}$$

Where:
BC_{OBC} = optimum asphalt binder content, percent based on total weight of mix
R_{RAP} = RAP ratio by weight of aggregate
BC_{RAP} = asphalt binder content of RAP, percent based on total weight of RAP mix

Replace item 4 in the list in the 8th paragraph of section 39-1.03E with:

04-20-12

4. HMA quality specified in the table titled "HMA Mix Design Requirements" except:
   4.1. Air void content, design value ±2.0 percent
   4.2. Voids filled with asphalt, report only
   4.3. Dust proportion, report only

Replace the 12th paragraph of section 39-1.03E with:

04-20-12

If tests on plant-produced samples do not verify the JMF, the Engineer notifies you and you must submit a new JMF or submit an adjusted JMF based on your testing. JMF adjustments may include a change in aggregate gradation TV within the TV limits specified in the aggregate gradation tables.

Replace the 14th paragraph of section 39-1.03E with:

01-20-12

A verified JMF is valid for 12 months.

Replace the last sentence in the 15th paragraph of section 39-1.03E with:

01-20-12

This deduction does not apply to verifications initiated by the Engineer or JMF renewal.

Replace the 16th paragraph of section 39-1.03E with:

02-22-13

Except for RAP substitution rate greater than 15 percent, for any HMA produced under the QC/QA process the Department does not use California Test 371 test results for verification.

Add between the 1st and 2nd paragraphs of section 39-1.03F:

04-20-12

Target asphalt binder content on your Contractor *Job Mix Formula Proposal* form and the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form must be the same.

01-20-12

Delete the 4th paragraph of section 39-1.03F.

Replace items 3 and 5 in the list in the 6th paragraph of section 39-1.03F with:

01-20-12

3. Engineer verifies each proposed JMF renewal within 20 days of receiving verification samples.
5. For each HMA type and aggregate gradation specified, the Engineer verifies at the Department's expense 1 proposed JMF renewal within a 12-month period.

Add between the 6th and 7th paragraphs of section 39-1.03F:

01-20-12

The most recent aggregate quality test results within the past 12 months may be used for verification of JMF renewal or the Engineer may perform aggregate quality tests for verification of JMF renewal.

Replace section 39-1.03G with:

04-20-12

39-1.03G Job Mix Formula Modification

For an accepted JMF, you may change asphalt binder source one time during production.

Submit your modified JMF request a minimum of 3 business days before production. Each modified JMF submittal must consist of:

1. Proposed modified JMF on *Contractor Job Mix Formula Proposal* form
2. Mix design records on *Contractor Hot Mix Asphalt Design Data* form for the accepted JMF to be modified
3. JMF verification on *Hot Mix Asphalt Verification* form for the accepted JMF to be modified
4. Quality characteristics test results for the modified JMF as specified in section 39-1.03B. Perform tests at the mix design OBC as shown on the *Contractor Asphalt Mix Design Data* form
5. If required, California Test 371 test results for the modified JMF.

With an accepted modified JMF submittal, the Engineer verifies each modified JMF within 5 business days of receiving all verification samples. If California Test 371 is required, the Engineer tests for California Test 371 within 10 days of receiving verification samples.

The Engineer verifies the modified JMF after the modified JMF HMA is placed on the project and verification samples are taken within the first 750 tons following sampling requirements in section 39-1.03E, "Job Mix Formula Verification." The Engineer tests verification samples for compliance with:

1. Stability as shown in the table titled "HMA Mix Design Requirements"
2. Air void content at design value ±2.0 percent
3. Voids in mineral aggregate as shown in the table titled "HMA Mix Design Requirements"
4. Voids filled with asphalt, report only

5. Dust proportion, report only

If the modified JMF is verified, the Engineer revises your *Hot Mix Asphalt Verification* form to include the new asphalt binder source. Your revised form will have the same expiration date as the original form.

If a modified JMF is not verified, stop production and any HMA placed using the modified JMF is rejected.

The Engineer deducts $2,000 from payments for each modified JMF verification. The Engineer deducts an additional $2,000 for each modified JMF verification that requires California Test 371.

Add to section 39-1.03:

01-20-12

39-1.03H Job Mix Formula Acceptance

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

Replace "3 days" in the 1st paragraph of section 39-1.04A with:

01-20-12

3 business days

Replace the 2nd sentence in the 2nd paragraph of section 39-1.04A with:

01-20-12

During production, take samples under California Test 125. You may sample HMA from:

Replace "batch" in the 2nd sentence in the 2nd paragraph of section 39-1.04C with:

07-19-13

lot. Each asphalt binder lot consist of 1 or multiple batches of combined asphalt binder, asphalt modifier, and CRM proportioned under section 39-1.02D.

Replace the 2nd paragraph of section 39-1.04E with:

02-22-13

For RAP substitution rate of 15 percent or less, sample RAP once daily.

For RAP substitution rate of greater than 15percent, sample processed RAP twice daily.

Perform QC testing for processed RAP aggregate gradation under California Test 367, appendix B, and submit the results with the combined aggregate gradation.

Replace "5 days" in the 1st paragraph of section 39-1.06 with:

01-20-12

5 business days

Replace the 3rd paragraph of section 39-1.08A with:

04-20-12

During production, you may adjust hot or cold feed proportion controls for virgin aggregate and RAP.

Add to section 39-1.08A:

04-20-12

During production, asphalt binder set point for HMA Type A, HMA Type B, HMA Type C, and RHMA-G must be the OBC shown in *Contractor Hot Mix Asphalt Design Data* form. For OGFC, asphalt binder set point must be the OBC shown on *Caltrans Hot Mix Asphalt Verification* form. If RAP is used, asphalt binder set point for HMA must be calculated as specified in section 39-1.03E.

07-19-13

For RAP substitution rate of 15 percent or less, you may adjust the RAP by -5 percent.

For RAP substitution greater than 15, you may adjust the RAP by -3 percent.

04-20-12

You must request adjustments to the plant asphalt binder set point based on new RAP stockpiles average asphalt binder content. Do not adjust the HMA plant asphalt binder set point until authorized.

Replace the 3rd paragraph of section 39-1.08B with:

09-16-11

Asphalt rubber binder must be from 375 to 425 degrees F when mixed with aggregate.

Add to the beginning of section 39-1.08C:

07-19-13

Asphalt rubber binder blending plants must have current qualification under the Department's Material Plant Quality Program.

Replace section 39-1.11 with:

01-18-13

39-1.11 CONSTRUCTION

39-1.11A General

Do not place HMA on wet pavement or a frozen surface.

You may deposit HMA in a windrow and load it in the paver if:

1. Paver is equipped with a hopper that automatically feeds the screed
2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
3. Activities for deposit, pickup, loading, and paving are continuous
4. HMA temperature in the windrow does not fall below 260 degrees F

You may place HMA in 1 or more layers on areas less than 5 feet wide and outside the traveled way, including shoulders. You may use mechanical equipment other than a paver for these areas. The equipment must produce uniform smoothness and texture.

HMA handled, spread, or windrowed must not stain the finished surface of any improvement, including pavement.

Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors.

HMA must be free of:

1. Segregation
2. Coarse or fine aggregate pockets
3. Hardened lumps

39-1.11B Longitudinal Joints

39-1.11B(1) General

Longitudinal joints in the top layer must match specified lane edges. Alternate the longitudinal joint offsets in the lower layers at least 0.5 foot from each side of the specified lane edges. You may request other longitudinal joint placement patterns.

A vertical longitudinal joint of more than 0.15 ft is not allowed at any time between adjacent lanes open to traffic.

For HMA thickness of 0.15 ft or less, the distance between the ends of the adjacent surfaced lanes at the end of each day's work must not be greater than can be completed in the following day of normal paving.

For HMA thickness greater than 0.15 ft, you must place HMA on adjacent traveled way lanes so that at the end of each work shift the distance between the ends of HMA layers on adjacent lanes is from 5 to 10 feet. Place additional HMA along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA to form temporary conforms. You may place Kraft paper or another authorized bond breaker under the conform tapers to facilitate the taper removal when paving operations resume.

39-1.11B(2) Tapered Notched Wedge

For divided highways with an HMA lift thickness greater than 0.15 foot, you may construct a 1-foot wide tapered notched wedge joint as a longitudinal joint between adjacent lanes open to traffic. A vertical notch of 0.75 inch maximum must be placed at the top and bottom of the tapered wedge.

The tapered notched wedge must retain its shape while exposed to traffic. Pave the adjacent lane within 1 day.

Construct the tapered portion of the tapered notched wedge with an authorized strike-off device. The strike-off device must provide a uniform slope and must not restrict the main screed of the paver.

You may use a device attached to the screed to construct longitudinal joints that will form a tapered notched wedge in a single pass. The tapered notched wedge must be compacted to a minimum of 91 percent compaction.

Perform QC testing on the completed tapered notch wedge joint as follows:

1. Perform field compaction tests at the rate of 1 test for each 750-foot section along the joint. Select random locations for testing within each 750-foot section.
2. Perform field compaction tests at the centerline of the joint, 6 inches from the upper vertical notch, after the adjacent lane is placed and before opening the pavement to traffic.
3. Determine maximum density test results.
4. Determine percent compaction of the longitudinal joint as the ratio of the average of the field compaction values and the maximum density test results.

For HMA under QC/QA construction process, the additional quality control compaction results associated with the tapered notch wedge will not be included in the computation of any quality factor and process control.

For acceptance of the completed tapered notch wedge joint, take two 4- or 6-inch diameter cores 6 inches from the upper vertical notch of the completed longitudinal joint for every 3,000 feet at locations designated by the Engineer. Take cores after the adjacent lane is placed and before opening the pavement to traffic. Cores must be taken in the presence of the Engineer and must be marked to identify the test sites. Submit the cores. One core will be used for determination of the field density and 1 core will be used for dispute resolution. The Engineer determines:

1. Field compaction by measuring the bulk specific gravity of the cores under California Test 308, Method A
2. Percent compaction as the ratio of the average of the bulk specific gravity of the core for each day's production to the maximum density test value

For HMA under QC/QA construction process, the additional quality assurance testing by the Engineer to determine field compaction associated with the tapered notch wedge will not be included in the Engineer's verification testing and in the computation of any quality factor and process control.

Determine percent compaction values each day the joint is completed and submit values within 24 hours of testing. If the percent compaction of 1 day's production is less than 91 percent, that day's notched wedge joint is rejected. Discontinue placement of the tapered notched wedge and notify the Engineer of changes you will make to your construction process in order to meet the specifications.

For HMA under QC/QA construction process, quantities of HMA placed in the completed longitudinal joint will have a quality factor QF_{QC5} of 1.0.

39-1.11C Widening Existing Pavement

If widening existing pavement, construct new pavement structure to match the elevation of the existing pavement's edge before placing HMA over the existing pavement.

39-1.11D Shoulders, Medians, and Other Road Connections

Until the adjoining through lane's top layer has been paved, do not pave the top layer of:

1. Shoulders
2. Tapers
3. Transitions
4. Road connections
5. Driveways
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Turn pockets

If the number of lanes changes, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, you may pave an adjoining area's top layer, including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.

39-1.11E Leveling

If leveling with HMA is specified, fill and level irregularities and ruts with HMA before spreading HMA over the base, existing surfaces, or bridge decks. You may use mechanical equipment other than a paver for these areas. The equipment must produce uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not paid for as HMA (leveling).

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material.

39-1.11F Compaction

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving. Complete finish rolling activities before the pavement surface temperature is:

1. Below 150 degrees F for HMA with unmodified binder
2. Below 140 degrees F for HMA with modified binder
3. Below 200 degrees F for RHMA-G

If a vibratory roller is used as a finish roller, turn the vibrator off.

Do not use a pneumatic-tired roller to compact RHMA-G.

For Standard and QC/QA construction processes, if 3/4-inch aggregate grading is specified, you may use a 1/2-inch aggregate grading if the specified total paved thickness is at least 0.15 foot and less than 0.20 foot thick.

Spread and compact HMA under sections 39-3.03 and 39-3.04 if any of the following applies:

1. Specified paved thickness is less than 0.15 foot.

2. Specified paved thickness is less than 0.20 foot and 3/4-inch aggregate grading is specified and used.
3. You spread and compact at:
   3.1. Asphalt concrete surfacing replacement areas
   3.2. Leveling courses
   3.3. Areas for which the Engineer determines conventional compaction and compaction measurement methods are impeded

Do not open new HMA pavement to public traffic until its mid-depth temperature is below 160 degrees F.

If you request and if authorized, you may cool HMA Type A and Type B with water when rolling activities are complete. Apply water under section 17-3.

Spread sand at a rate from 1 to 2 lb/sq yd on new RHMA-G, RHMA-O, and RHMA-O-HB pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with section 90-1.02C(4)(c). Keep traffic off the pavement until spreading sand is complete.

Replace the 5th and 6th paragraphs of section 39-1.12C with:

07-20-12

On tangents and horizontal curves with a centerline radius of curvature 2,000 feet or more, the PI_0 must be at most 2.5 inches per 0.1-mile section.

On horizontal curves with a centerline radius of curvature between 1,000 feet and 2,000 feet including pavement within the superelevation transitions, the PI_0 must be at most 5 inches per 0.1-mile section.

Add to section 39-1.12:

01-20-12

39-1.12E Reserved

Add to section 39-1.14:

01-20-12

Prepare the area to receive HMA for miscellaneous areas and dikes, including any excavation and backfill as needed.

Replace "6.8" in item 3 in the list in the 4th paragraph of section 39-1.14 with:

04-20-12

6.4

Replace "6.0" in item 3 in the list in the 4th paragraph of section 39-1.14 with:

04-20-12

5.7

Replace "6.8" in the 1st paragraph of section 39-1.15B with:

04-20-12

6.4

Replace "6.0" in the 1st paragraph of section 39-1.15B with:

04-20-12

5.7

Replace the 1st paragraph of section 39-2.02B with:

02-22-13

Perform sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	RHMA-G	OGFC
Aggregate gradation[a]	California Test 202	1 per 750 tons and any remaining part at the end of the project	JMF ± Tolerance[b]	JMF ± Tolerance[b]	JMF ± Tolerance[b]	JMF ± Tolerance[b]
Sand equivalent (min)[c]	California Test 217		47	42	47	--
Asphalt binder content (%)	California Test 379 or 382		JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (%, max)	California Test 226 or 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	1.0
Field compaction (% max. theoretical density)[d,e]	QC plan	2 per business day (min.)	91–97	91–97	91–97	--
Stabilometer value (min)[c]	California Test 366	1 per 4,000 tons or 2 per 5 business days, whichever is greater				
No. 4 and 3/8" gradings			30	30	--	--
1/2" and 3/4" gradings			37	35	23	--
Air void content (%)[c, f]	California Test 367		4 ± 2	4 ± 2	TV ± 2	--
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants[g]	California Test 226 or 370	2 per day during production	--	--	--	--
Percent of crushed particles coarse aggregate (%, min)	California Test 205	As designated in the QC plan. At least once per project				
One fractured face			90	25	--	90
Two fractured faces			75	--	90	75
Fine aggregate (%, min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face			70	20	70	90
Los Angeles Rattler (%, max) Loss at 100 rev.	California Test 211		12	--	12	12

Loss at 500 rev.			45	50	40	40
Flat and elongated particles (%, max by weight @ 5:1)	California Test 235		Report only	Report only	Report only	Report only
Fine aggregate angularity (%, min)[h]	California Test 234		45	45	45	--
Voids filled with asphalt (%)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only	--
Voids in mineral aggregate (% min)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	 -- -- 18.0–23.0 18.0–23.0	--
Dust proportion[i] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367		 0.6-1.2 0.6–1.2	 0.6-1.2 0.6–1.2	Report only	--
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)[j] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is more	 10,000 15,000 20,000 25,000	 10,000 15,000 20,000 25,000	--	--
Hamburg wheel track (inflection point minimum number of passes)[j] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is more	 10,000 10,000 12,500 15000	 10,000 10,000 12,500 15000	--	--
Moisture susceptibility (minimum dry strength, psi)[j]	California Test 371	For RAP ≥15% 1 per 10,000 tons or 1 per project whichever is greater	120	120	--	--
Moisture susceptibility (tensile strength ration, %)[j]	California Test 371	For RAP ≥15% 1 per 10,000 tons or 1	70	70	--	--

		per project whichever is greater				
Smoothness	Section 39-1.12	--	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	Section 39-1.04C	--	--	1,500–4,000	1,500–4,000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D

[a] Determine combined aggregate gradation containing RAP under California Test 367.
[b] The tolerances must comply with the allowable tolerances in section 39-1.02E.
[c] Report the average of 3 tests from a single split sample.
[d] Determine field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[e] To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[f] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[g] For adjusting the plant controller at the HMA plant.
[h] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[i] Report only.
[j] Applies to RAP substitution rate greater than 15 percent.

Replace the 1st paragraph of section 39-2.03A with:

02-22-13

The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

HMA Acceptance—Standard Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	California Test 202	JMF ± tolerance [c]	JMF ± tolerance [c]	JMF ± tolerance [c]	JMF ± tolerance [c]
Sieve: 3/4" / 1/2" / 3/8"					
1/2": X [b] /					
3/8": / X /					
No. 4: / / X					
No. 8: X / X / X					
No. 200: X / X / X					
Sand equivalent (min) [d]	California Test 217	47	42	47	--
Asphalt binder content (%)	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (%, max)	California Test 226 or 370	1.0	1.0	1.0	1.0
Field compaction (% max. theoretical density) [e, f]	California Test 375	91–97	91–97	91–97	--
Stabilometer value (min)[d,]	California Test 366				
No. 4 and 3/8" gradings		30	30	--	--
1/2" and 3/4" gradings		37	35	23	--
Air void content (%) [d, g]	California Test 367	4 ± 2	4 ± 2	TV ± 2	--
Percent of crushed particles	California Test 205				
Coarse aggregate (%, min)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (%, min) (Passing no. 4 sieve and retained on no. 8 sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (%, max)	California Test 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Fine aggregate angularity (%, min)[h]	California Test 234	45	45	45	--
Flat and elongated particles (%, max by weight @ 5:1)	California Test 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [i]	California Test 367				
No. 4 grading		65.0–75.0	65.0–75.0	Report only	--
3/8" grading		65.0–75.0	65.0–75.0		
1/2" grading		65.0–75.0	65.0–75.0		
3/4" grading		65.0–75.0	65.0–75.0		
Voids in mineral aggregate (% min) [i]	California Test 367				
No. 4 grading		17.0	17.0	--	--
3/8" grading		15.0	15.0	--	
1/2" grading		14.0	14.0	18.0–23.0	
3/4" grading		13.0	13.0	18.0–23.0	
Dust proportion [l]	California			Report only	--

No. 4 and 3/8" gradings 1/2" and 3/4" gradings	Test 367	0.6-1.2 0.6–1.2	0.6-1.2 0.6–1.2		
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)[j] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	10,000 15,000 20,000 25,000	10,000 15,000 20,000 25,000	--	--
Hamburg wheel track (inflection point minimum number of passes)[j] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	10,000 10,000 12,500 15000	10,000 10,000 12,500 15000	--	--
Moisture susceptibility (minimum dry strength, psi)[j]	California Test 371	120	120	--	--
Moisture susceptibility (tensile strength ration, %)[j]	California Test 371	70	70	--	--
Smoothness	Section 39-1.12	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge and must grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	Section 39-1.02D

[a] The Engineer determines combined aggregate gradations containing RAP under California Test 367.
[b] "X" denotes the sieves the Engineer tests for the specified aggregate gradation.
[c] The tolerances must comply with the allowable tolerances in section 39-1.02E.
[d] The Engineer reports the average of 3 tests from a single split sample.
[e] The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[f] To determine field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[g]The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[h] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[i] Report only.
[j]Applies to RAP substitution rate greater than 15 percent.

Replace the 5th paragraph of section 39-2.03A with:

01-20-12

The Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.2 foot and any layer is less than 0.20 foot.

Replace the 1st paragraph of section 39-3.02A with:

02-22-13

The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

HMA Acceptance—Method Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	California Test 202	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]
Sand equivalent (min) [c]	California Test 217	47	42	47	--
Asphalt binder content (%)	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (%, max)	California Test 226 or 370	1.0	1.0	1.0	1.0
Stabilometer value (min) [c]	California Test 366				
No. 4 and 3/8" gradings		30	30	--	--
1/2" and 3/4" gradings		37	35	23	--
Percent of crushed particles	California Test 205				
Coarse aggregate (% min)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (% max)	California Test 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air void content (%) [c, d]	California Test 367	4 ± 2	4 ± 2	TV ± 2	--
Fine aggregate angularity (% min) [e]	California Test 234	45	45	45	--
Flat and elongated particles (% max by weight @ 5:1)	California Test 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [f]	California Test 367				
No. 4 grading		65.0–75.0	65.0–75.0	Report only	--
3/8" grading		65.0–75.0	65.0–75.0		
1/2" grading		65.0–75.0	65.0–75.0		
3/4" grading		65.0–75.0	65.0–75.0		
Voids in mineral aggregate (% min) [f]	California Test 367				
No. 4 grading		17.0	17.0	--	--
3/8" grading		15.0	15.0	--	
1/2" grading		14.0	14.0	18.0–23.0	
3/4" grading		13.0	13.0	18.0–23.0	
Dust proportion [f]	California Test 367				
No. 4 and 3/8" gradings		0.6–1.2	0.6–1.2	Report only	--
1/2" and 3/4" gradings		0.6–1.2	0.6–1.2		
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth) [g]	AASHTO T 324 (Modified)			--	--
PG-58		10,000	10,000		
PG-64		15,000	15,000		

PG-70 PG-76 or higher		20,000 25,000	20,000 25,000		
Hamburg wheel track (inflection point minimum number of passes)[g] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	 10,000 10,000 12,500 15000	 10,000 10,000 12,500 15000	--	--
Moisture susceptibility (minimum dry strength, psi)[g]	California Test 371	120	120	--	--
Moisture susceptibility (tensile strength ration, %)[g]	California Test 371	70	70	--	--
Smoothness	Section 39-1.12	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	Section 39-1.02D

[a] The Engineer determines combined aggregate gradations containing RAP under California Test 367.
[b] The tolerances must comply with the allowable tolerances in section 39-1.02E.
[c] The Engineer reports the average of 3 tests from a single split sample.
[d] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[e] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[f] Report only.
[g] Applies to RAP substitution rate greater than 15 percent.

Replace "280 degrees F" in item 2 in the list in the 6th paragraph of section 39-3.04 with:

01-20-12

285 degrees F

Replace "5,000" in the 5th paragraph of section 39-4.02C with:

02-22-13

10,000

Replace the 7th paragraph of section 39-4.02C with:

02-22-13

Except for RAP substitution rate of greater than 15 percent, the Department does not use results from California Test 371 to determine specification compliance.

Replace the 8th paragraph of section 39-4.02C with:

02-22-13

Comply with the values for the HMA quality characteristics and minimum random sampling and testing for quality control shown in the following table:

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
Aggregate gradation[a]	California Test 202	1 per 750 tons	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]	California Test 125	24 hours
Asphalt binder content (%)	California Test 379 or 382		JMF±0.40	JMF±0.40	JMF ±0.40	Loose mix behind paver See California Test 125	
Field compaction (% max. theoretical density)[c,d]	QC plan		92–96	92–96	91–96	QC plan	
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants[e]	California Test 226 or 370	2 per day during production	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent (min)[f]	California Test 217	1 per 750 tons	47	42	47	California Test 125	24 hours
HMA moisture content (%,max)	California Test 226 or 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	Loose Mix Behind Paver See California Test 125	24 hours
Stabilometer value (min)[f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 366	1 per 4,000 tons or 2 per 5 business days, whichever is greater	30 37	30 35	-- 23		48 hours
Air void content (%)[f,g]	California Test 367		4 ± 2	4 ± 2	TV ± 2		

Percent of crushed particles coarse aggregate (% min.): One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve): One fractured face	California Test 205	As designated in QC plan. At least once per project.	90 75 70	25 -- 20	-- 90 70	California Test 125	48 hours
Los Angeles Rattler (% max): Loss at 100 rev. Loss at 500 rev.	California Test 211		12 45	-- 50	12 40	California Test 125	
Fine aggregate angularity (% min) [h]	California Test 234		45	45	45	California Test 125	
Flat and elongated particle (% max by weight @ 5:1)	California Test 235		Report only	Report only	Report only	California Test 125	
Voids filled with asphalt (%)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only		
Voids in mineral aggregate (% min.)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0–23.0 18.0–23.0		

Dust proportion[i] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367		0.6–1.2 0.6–1.2	0.6–1.2 0.6–1.2	Report only		
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)[i] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is greater	10,000 15,000 20,000 25,000	10,000 15,000 20,000 25,000	--	--	
Hamburg wheel track (inflection point minimum number of passes)[j] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is greater	10,000 10,000 12,500 15000	10,000 10,000 12,500 15000	--	--	
Moisture susceptibility (minimum dry strength, psi)[j]	California Test 371	1 per 10,000 tons or 1 per project whichever is greater	120	120	--	--	
Moisture susceptibility (tensile strength ratio, %)[j]	California Test 371	1 per 10,000 tons or 1 per project whichever is greater	70	70	70	--	
Smoothness	Section 39-1.12	--	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0	--	
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	--	--	--	1,500–4,000	Section 39-1.02D	24 hours
CRM	Section 39-1.02D	--	--	--	Section 39-1.02D	Section 39-1.02D	48 hours

[a] Determine combined aggregate gradation containing RAP under California Test 367.
[b] The tolerances must comply with the allowable tolerances in section 39-1.02E.
[c] Determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[d] To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[e] For adjusting the plant controller at the HMA plant.
[f] Report the average of 3 tests from a single split sample.
[g] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[h] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[i] Report only.
[j] Applies to RAP substitution rate greater than 15 percent.

Replace the 1st sentence in the 1st paragraph of section 39-4.03B(2) with:

01-20-12

For aggregate gradation and asphalt binder content, the minimum ratio of verification testing frequency to quality control testing frequency is 1:5.

Replace the 2nd "and" in the 7th paragraph of section 39-4.03B(2) with:

01-20-12

or

Replace the 1st paragraph of section 39-4.04A with:

02-22-13

The Engineer samples for acceptance testing and tests for the following quality characteristics:

HMA Acceptance—QC/QA Construction Process

Index (i)	Quality characteristic				Weight-ing factor (w)	Test method	HMA type		
							A	B	RHMA-G
		Aggregate gradation [a]							
	Sieve	3/4"	1/2"	3/8"					
1	1/2"	X [b]	--	--	0.05	California Test 202	JMF ± Tolerance [c]		
1	3/8"	--	X	--	0.05				
1	No. 4	--	--	X	0.05				
2	No. 8	X	X	X	0.10				
3	No. 200	X	X	X	0.15				
4	Asphalt binder content (%)				0.30	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40
5	Field compaction (% max. theoretical density) [d, e]				0.40	California Test 375	92–96	92–96	91–96
	Sand equivalent (min) [f]					California Test 217	47	42	47
	Stabilometer value (min) [f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings					California Test 366	 30 37	 30 35	 -- 23
	Air void content (%) [f, g]					California Test 367	4 ± 2	4 ± 2	TV ± 2
	Percent of crushed particles coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on No. 8 sieve.) One fractured face					California Test 205	 90 75 70	 25 -- 20	 -- 90 70
	HMA moisture content (%, max)					California Test 226 or 370	1.0	1.0	1.0
	Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.					California Test 211	 12 45	 -- 50	 12 40
	Fine aggregate angularity (% min) [h]					California Test 234	45	45	45
	Flat and elongated particle (% max by weight @ 5:1)					California Test 235	Report only	Report only	Report only
	Voids in mineral aggregate (% min) [i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading					California Test 367	 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	 -- -- 18.0–23.0 18.0–23.0

	Voids filled with asphalt (%) [i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading		California Test 367	 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only
	Dust proportion [i] No. 4 and 3/8" gradings 1/2" and 3/4" gradings		California Test 367	 0.6–1.2 0.6–1.2	 0.6–1.2 0.6–1.2	Report only
	Hamburg Wheel Tracker (minimum number of passes at 0.5 inch average rut depth) [j] PG-58 PG-64 PG-70 PG-76 or higher		AASHTO T 324 (Modified)	 10,000 15,000 20,000 25,000	 10,000 15,000 20,000 25,000	--
	Hamburg Wheel Tracker (inflection point minimum number of passes) [j] PG-58 PG-64 PG-70 PG-76 or higher		AASHTO T 324 (Modified)	 10,000 15,000 20,000 25,000	 10,000 15,000 20,000 25,000	--
	Moisture susceptibility (minimum dry strength, psi) [j]		California Test 371	120	120	--
	Moisture susceptibility (tensile strength ratio %) [j]		California Test 371	70	70	70
	Smoothness		Section 39-1.12	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0
	Asphalt binder		Various	Section 92	Section 92	Section 92
	Asphalt rubber binder		Various	--	--	Section 92-1.01D(2) and section 39-1.02D
	Asphalt modifier		Various	--	--	Section 39-1.02D
	CRM		Various	--	--	Section 39-1.02D

[a] The Engineer determines combined aggregate gradations containing RAP under California Test 367.
[b] "X" denotes the sieves the Engineer tests for the specified aggregate gradation.
[c] The tolerances must comply with the allowable tolerances in section 39-1.02E.
[d] The Engineer determines field compaction for any of the following conditions:
1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and less than 0.20 foot.2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[e] To determine field compaction, the Engineer uses:
1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[f] The Engineer reports the average of 3 tests from a single split sample.
[g] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[h] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[i] Report only.
[j] Applies to RAP substitution rate greater than 15 percent.

Replace the 3rd paragraph of section 39-4.04A with:

01-20-12

The Department determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any lager is less than 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 and any layer is less than 0.20 foot.

^^

40 CONCRETE PAVEMENT

07-19-13

Replace the headings and paragraphs in section 40 with:

07-19-13

40-1 GENERAL

40-1.01 GENERAL

40-1.01A Summary

Section 40-1 includes general specifications for constructing concrete pavement.

40-1.01B Definitions

concrete raveling: Progressive disintegration of the pavement surface resulting from dislodged aggregate.

full depth crack: Crack that runs from one edge of the slab to the opposite or adjacent side of the slab, except a crack parallel to and within 0.5 foot of either side of a planned contraction joint

working crack: Crack that extends through the full depth of the slab and is parallel to and within 0.5 foot of either side of a planned contraction joint.

action limit: Value at which corrective actions must be made while production may continue.

suspension limit: Value at which production must be suspended while corrections are made.

40-1.01C Submittals

40-1.01C(1) General

At least 15 days before delivery to the job site, submit manufacturer's recommendations and instructions for storage and installation of:

1. Threaded tie bar splice couplers
2. Joint filler

As an informational submittal, submit calibration documentation and operational guidelines for frequency measuring devices (tachometer) for concrete consolidation vibrators.

Submit updated quality control charts each paving day.

40-1.01C(2) Certificates of Compliance

Submit a certificate of compliance for:

1. Tie bars
2. Threaded tie bar splice couplers
3. Dowel bars
4. Tie bar baskets
5. Dowel bar baskets
6. Joint filler
7. Epoxy powder coating

40-1.01C(3) Quality Control Plan

Submit a concrete pavement QC plan. Allow 30 days for review.

40-1.01C(4) Mix Design

At least 15 days before testing for mix proportions, submit a copy of the AASHTO accreditation for your laboratory determining the mix proportions. At least 15 days before starting field qualification, submit the proposed concrete mix proportions, the corresponding mix identifications, and laboratory test reports including the modulus of rupture for each trial mixture at 10, 21, 28, and 42 days.

40-1.01C(5) Concrete Field Qualification

Submit field qualification data and test reports including:

1. Mixing date
2. Mixing equipment and procedures used
3. Batch volume in cubic yards. The minimum batch size is 5 cu yd.
4. Type and source of ingredients used
5. Penetration of the concrete
6. Air content of the plastic concrete
7. Age and strength at time of concrete beam testing

Field qualification test reports must be certified with a signature by an official in responsible charge of the laboratory performing the tests.

40-1.01C(6) Cores

Submit for authorization the name of the laboratory you propose to use for testing the cores for air content.

Submit each core in an individual plastic bag marked with a location description.

40-1.01C(7) Profile Data and Straightedge Measurements

At least 5 business days before start of initial profiling or changing profiler or operator, submit:

1. Inertial profiler (IP) certification issued by the Department. The certification must not be more than 12 months old.
2. Operator certification for the IP issued by the Department. The operator must be certified for each different model of IP device operated. The certification must not be more than 12 months old.

3. List of manufacturer's recommended test procedures for IP calibration and verification.

Within 2 business days after cross correlation testing, submit ProVAL profiler certification analysis report for cross correlation test results performed on test section. ProVAL is FHWA's software. Submit the certification analysis report to the Engineer and to the electronic mailbox address:

smoothness@dot.ca.gov

Within 2 business days after each day of inertial profiling, submit profile data to the Engineer and to the electronic mailbox address:

smoothness@dot.ca.gov

Within 2 business days of performing straightedge testing, submit a report of areas requiring smoothness correction.

40-1.01C(8)–40-1.01C(12) Reserved

40-1.01D Quality Control and Assurance

40-1.01D(1) General

If the pavement quantity is at least 2000 cu yd, provide a QC manager.

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

For the Department's modulus of rupture testing, assist the Engineer in fabricating test beams by providing materials and labor.

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. Notify the Engineer when the pavement is ready for testing which is the latter of:

1. Seven days after paving
2. When the pavement has attained a modulus of rupture of at least 550 psi

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

40-1.01D(2) Prepaving Conference

Schedule a prepaving conference at a mutually agreed upon time and place to meet with the Engineer. Make the arrangements for the conference facility. Discuss QC plan and methods of performing each item of the work.

Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. QC manager
3. Paving construction foreman
4. Workers and your subcontractor's workers, including:
   - 4.1. Foremen including subcontractor's Foremen
   - 4.2. Concrete plant manager
   - 4.3. Concrete plant operator

Do not start paving activities including test strips until the listed personnel have attended a prepaving conference.

40-1.01D(3) Just-In-Time-Training

Reserved

40-1.01D(4) Quality Control Plan

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 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.

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. Bar reinforcement placement and alignment
11. Dowel bar placement, alignment, and anchorage
12. Tie bar placement
13. Modulus of rupture
14. Finishing and curing
15. Protecting pavement
16. Surface smoothness

40-1.01D(5) Mix Design

Use a laboratory that complies with ASTM C 1077 to determine the mix proportions for concrete pavement. The laboratory must have a current AASHTO accreditation for:

1. AASHTO T 97 or ASTM C 78
2. ASTM C 192/C 192M

Make trial mixtures no more than 24 months before field qualification.

Using your trial mixtures, determine the minimum cementitious materials content. Use your value for minimum cementitious material content for *MC* in equation 1 and equation 2 of section 90-1.02B(3).

To determine the minimum cementitious materials content or maximum water to cementitious materials ratio, use modulus of rupture values of at least 570 psi for 28 days age and at least 650 psi for 42 days age.

If changing an aggregate supply source or the mix proportions, produce a trial batch and field-qualify the new concrete. The Engineer does not adjust contract time for performing sampling, testing, and qualifying new mix proportions or changing an aggregate supply source.

40-1.01D(6) Quality Control Testing

40-1.01D(6)(a) General

Testing laboratories and testing equipment must comply with the Department's Independent Assurance Program.

40-1.01D(6)(b) Concrete Mix

Before placing pavement, your mix design must be field qualified. Use an ACI certified "Concrete Laboratory Technician, Grade I" to perform field qualification tests and calculations. Test for modulus of rupture under California Test 523 at 10, 21, and 28 days of age.

When placing pavement, your quality control must include testing properties at the frequencies shown in the following table:

QC Testing Frequency

Property	Test method	Minimum frequency
Cleanness value	California Test 227	2 per day
Sand equivalent	California Test 217	2 per day
Aggregate gradation	California Test 202	2 per day
Air content (air entrainment specified)	California Test 504	1 per hour
Air content (air entrainment not specified)	California Test 504	1 per 4 hours
Density	California Test 518	1 per 4 hours
Penetration	California Test 533	1 per 4 hours
Aggregate moisture meter calibration[a]	California Test 223 or California Test 226	1 per day

[a] Check 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. 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.

40-1.01D(6)(c) Pavement Smoothness

40-1.01D(6)(c)(i) General

Notify the Engineer 2 business days before performing smoothness testing including IP calibration and verification testing. The notification must include start time and locations by station.

Before testing the pavement smoothness, remove foreign objects from the surface, and mark the beginning and ending station on the pavement shoulder.

Test pavement smoothness using an IP except use a 12-foot straightedge at the following locations:

1. Traffic lanes less than 1,000 feet in length including ramps, turn lanes, and acceleration and deceleration lanes
2. Areas within 15 feet of manholes
3. Shoulders
4. Weigh-in-motion areas
5. Miscellaneous areas such as medians, gore areas, turnouts, and maintenance pullouts

40-1.01D(6)(c)(ii) Straightedge Testing

Identify locations of areas requiring correction by:

1. Location Number
2. District-County-Route
3. Beginning station or post mile to the nearest 0.01 mile
4. For correction areas within a lane:
   - 4.1. Lane direction as NB, SB, EB, or WB
   - 4.2. Lane number from left to right in direction of travel
   - 4.3. Wheel path as "L" for left, "R" for right, or "B" for both
5. For correction areas not within a lane:
   - 5.1. Identify pavement area (e.g., shoulder, weight station, turnout)
   - 5.2. Direction and distance from centerline as "L" for left or "R" for right
6. Estimated size of correction area

40-1.01D(6)(c)(iii) Inertial Profile Testing

IP equipment must display a current certification decal with expiration date.

Conduct cross correlation IP verification test in the Engineer's presence before performing initial profiling. Verify cross correlation IP verification test at least annually. Conduct 5 repeat runs of the IP on an authorized test section. The test section must be on an existing concrete pavement surface 0.1 mile long. Calculate a cross correlation to determine the repeatability of your device under Section 8.3.1.2 of AASHTO R 56 using ProVAL profiler certification analysis with a 3 feet maximum offset. The cross correlation must be a minimum of 0.92.

Conduct the following IP calibration and verification tests in the Engineer's presence each day before performing inertial profiling:

1. Block test. Verify the height sensor accuracy under AASHTO R 57, section 5.3.2.3.
2. Bounce test. Verify the combined height sensor and accelerometer accuracy under AASHTO R 57, section 5.3.2.3.2.
3. DMI test. Calibrate the accuracy of the testing procedure under AASHTO R 56, section 8.4.
4. Manufacturer's recommended tests.

Collect IP data using the specified ProVAL analysis with 250 mm and IRI filters. Comply with the requirements for data collection under AASHTO R 56.

For IP testing, wheel paths are 3 feet from and parallel to the edge of a lane. Left and right are relative to the direction of travel. The IRI is the pavement smoothness along a wheel path of a given lane. The MRI is the average of the IRI values for the left and right wheel path from the same lane.

Operate the IP according to the manufacturer's recommendations and AASHTO R 57 at 1-inch recording intervals and a minimum 4 inch line laser sensor.

Collect IP data under AASHTO R 56.IP data must include:

1. Raw profile data for each lane.
2. ProVAL ride quality analysis report for the international roughness index (IRI) of left and right wheel paths of each lane. Submit in pdf file format.
3. ProVAL ride quality analysis report for the mean roughness index (MRI) of each lane. Submit in pdf file format.
4. ProVAL smoothness assurance analysis report for IRIs of left wheel path. Submit in pdf file format.
5. ProVAL smoothness assurance analysis report for IRIs of right wheel path. Submit in pdf file format.
6. GPS data file for each lane in GPS exchange. Submit in GPS eXchange file format.
7. Manufacturer's recommended IP calibration and verification tests results.
8. AASHTO IP calibration and verification test results including bounce, block, and distance measurement instrument (DMI).

Submit the IP raw profile data in unfiltered electronic pavement profile file (PPF) format. Name the PPF file using the following naming convention:

YYYYMMDD_TTCCCRRR_D_L_W_S_X_PT.PPF

where:
YYYY = year
MM = Month, leading zero
DD = Day of month, leading zero
TT = District, leading zero
CCC = County, 2 or 3 letter abbreviation as shown in section 1-1.08
RRR = Route number, no leading zeros
D = Traffic direction as NB, SB, WB, or EB
L = Lane number from left to right in direction of travel
W = Wheel path as "L" for left, "R" for right, or "B" for both
S = Beginning station to the nearest foot (e.g., 10+20) or beginning post mile to the nearest hundredth (e.g., 25.06) no leading zero
X = Profile operation as "EXIST" for existing pavement, "PAVE" for after paving, or "CORR" for after final surface pavement correction
PT = Pavement type (e.g., "concrete", etc.)

Determine IRIs using the ProVAL ride quality analysis with a 250 mm and IRI filters. While collecting the profile data to determine IRI, record the following locations in the raw profile data:

1. Begin and end of all bridge approach slabs
2. Begin and end of all bridges
3. Begin and end of all culverts visible on the roadway surface

For each 0.1 mile section, your IRI values must be within 10 percent of the Department's IRI values. The Engineer may order you to recalibrate your IP equipment and reprofile. If your results are inaccurate due to operator error, the Engineer may disqualify your IP operator.

Determine the MRI for 0.1-mile fixed sections. A partial section less than 0.1 mile that is the result of an interruption to continuous pavement surface must comply with the MRI specifications for a full section. Adjust the MRI for a partial section to reflect a full section based on the proportion of a section paved.

Determine the areas of localized roughness. Use the ProVAL smoothness assurance with a continuous IRI for each wheel path, 25-foot interval, and 250 mm and IRI filters.

40-1.01D(6)(c)(iv) Reserved

40-1.01D(6)(d)–40-1.01D(6)(h) Reserved

40-1.01D(7) Pavement Acceptance

40-1.01D(7)(a) Acceptance Testing

40-1.01D(7)(a)(i) General

The Department's acceptance testing includes testing the pavement properties at the minimum frequencies shown in the following table:

Acceptance Testing

Property	Test Method		Frequency[a]
	CRCP	JPCP	
Modulus of rupture (28 day)	California Test 523		1,000 cu yd
Air content[b]	California Test 504		1 day's paving
Dowel bar placement	--	Measurement[a]	700 sq yd
Tie bar placement	--	Measurement[a]	4,000 sq yd
Thickness	California Test 531		1,200 sq yd
Coefficient of friction	California Test 342		1 day's paving

[a]A single test represents no more than the frequency specified.
[b]Tested only when air entrainment is specified.

Pavement smoothness may be accepted based on your testing in the absence of the Department's testing.

40-1.01D(7)(a)(ii) Air Content

If air-entraining admixtures are specified, the Engineer uses a t-test to compare your QC test results with the Department's test results. The t-value for test data is determined using the following equation:

where:

n_c = Number of your quality control tests (minimum of 6 required)
n_v = Number of Department's tests (minimum of 2 required)
$\overline{X}_c$ = Mean of your quality control tests
$\overline{X}_v$ = Mean of the Department's tests
S_p = Pooled standard deviation
(When $n_v = 1$, $S_p = S_c$)
S_c = Standard deviation of your quality control tests
S_v = Standard deviation of the Department's tests (when $n_v > 1$)

The Engineer compares your QC test results with the Department's test results at a level of significance of $\alpha = 0.01$. The Engineer compares the t-value to tcrit, using degrees of freedom showing in the following table:

degrees of freedom (nc+nv-2)	tcrit (for $\alpha = 0.01$)
1	63.657
2	9.925
3	5.841
4	4.604
5	4.032
6	3.707
7	3.499
8	3.355
9	3.250
10	3.169

If the t-value calculated is less than or equal to tcrit, your quality control test results are verified. If the t-value calculated is greater than tcrit, quality control test results are not verified.

If your quality control test results are not verified, core at least 3 specimens from concrete pavement under section 40-1.03P. The Engineer selects the core locations. The authorized laboratory must test these specimens for air content under ASTM C 457. The Engineer compares these test results with your quality control test results using the t-test method. If your quality control test results are verified based on this comparison, the Engineer uses the quality control test results for acceptance of concrete pavement for air content. If your quality control test results are not verified based on this comparison, the Engineer uses the air content of core specimens determined by the authorized laboratory under ASTM C 457 for acceptance.

40-1.01D(7)(a)(iii) Dowel and Tie Bar Placement

For JPCP, drill cores under section 40-1.03P for the Department's acceptance testing.

The Engineer identifies which joint and dowel or tie bar are to be tested. Core each day's paving within 2 business days. Each dowel or tie bar test consists of 2 cores, 1 on each bar end to expose both ends and allow measurement.

If the tests indicate dowel or tie bars are not placed within the specified tolerances or if there is unconsolidated concrete around the dowel or tie bars, core additional specimens identified by Engineer to determine the limits of unacceptable work.

40-1.01D(7)(a)(iv) Thickness

Drill cores under section 40-1.03P for the Department's acceptance testing in the primary area, which is the area placed in 1 day for each thickness. Core at locations determined by the Engineer and in the Engineer's presence.

Do not core until any grinding has been completed.

The core specimen diameter must be 4 inches. To identify the limits of concrete pavement deficient in thickness by more than 0.05 foot, you may divide primary areas into secondary areas. The Engineer measures cores under California Test 531 to the nearest 0.01 foot. Core at least 1 foot from existing, contiguous, and parallel concrete pavement not constructed as part of this Contract.

You may request the Engineer make additional thickness measurements and use them to determine the average thickness variation. The Engineer determines the locations with random sampling methods.

If each thickness measurement in a primary area is less than 0.05 foot deficient, the Engineer calculates the average thickness deficiency in that primary area. The Engineer uses 0.02 foot for a thickness difference more than 0.02 foot over the specified thickness.

For each thickness measurement in a primary area deficient by more than 0.05 foot, the Engineer determines a secondary area where the thickness deficiency is more than 0.05 foot. The Engineer determines this secondary area by measuring the thickness of each concrete pavement slab adjacent to the measurement found to be more than 0.05 foot deficient. The Engineer continues to measure the thickness until an area that is bound by slabs with thickness deficient by 0.05 foot or less is determined.

Slabs without bar reinforcement are defined by the areas bound by longitudinal and transverse joints and concrete pavement edges. Slabs with bar reinforcement are defined by the areas bound by longitudinal joints and concrete pavement edges and 15-foot lengths. Secondary area thickness measurements in a slab determine that entire slab's thickness.

The Engineer measures the remaining primary area thickness after removing the secondary areas from consideration for determining the average thickness deficiency.

40-1.01D(7)(a)(v)–40-1.01D(7)(a)(ix) Reserved

40-1.01D(7)(b) Acceptance Criteria

40-1.01D(7)(b)(i) General

Reserved

40-1.01D(7)(b)(ii) Modulus of Rupture

For field qualification, the modulus of rupture at no later than 28 days must be at least:

1. 550 psi for each single beam

2. 570 psi for the average of 5 beams

For production, the modulus of rupture for the average of the individual test results of 2 beams aged for 28 days must be at least 570 psi.

40-1.01D(7)(b)(iii) Air Content

The air content must be within ±1.5 percent of the specified value. If no value is specified, the air content must be within ±1.5 percent of, the value used for your approved mix design.

40-1.01D(7)(b)(iv) Bar Reinforcement

In addition to requirements of Section 52, bar reinforcement must be more than 1/2 inch below the saw cut depth at concrete pavement joints.

40-1.01D(7)(b)(v) Dowel Bar and Tie Bar Placement

Tie bar placement must comply with the tolerances shown in the following table:

Tie Bar Tolerance

Dimension	Tolerance
Horizontal and vertical skew	5 1/4 inch, max
Longitudinal translation	± 2 inch
Horizontal offset (embedment)	± 2 inch
Vertical depth	1. At least 1/2 inch below the bottom of the saw cut 2. When measured at any point along the bar, not less than 2 inches clear of the pavement's surface and bottom

NOTE: Tolerances are measured relative to the completed joint.

Dowel bar placement must comply with the tolerances shown in the following table:

Dowel Bar Tolerances

Dimension	Tolerance
Horizontal offset	±1 inch
Longitudinal translation	±2 inch
Horizontal skew	5/8 inch, max
Vertical skew	5/8 inch, max
Vertical depth	The minimum distance measured from concrete pavement surface to any point along the top of dowel bar must be: DB + 1/2 inch where: DB = one third of pavement thickness in inches, or the saw cut depth, whichever is greater The maximum distance below the depth shown must be 5/8 inch.

NOTE: Tolerances are measured relative to the completed joint.

The Engineer determines the limits for removal and replacement.

40-1.01D(7)(b)(vi) Pavement Thickness

Concrete pavement thickness must not be deficient by more than 0.05 foot.

The minimum thickness is not reduced for specifications that may affect concrete pavement thickness such as allowable tolerances for subgrade construction.

The Engineer determines the areas of noncompliant pavement, the thickness deficiencies, and the limits where removal is required.

Pavement with an average thickness deficiency less than 0.01 foot is acceptable. If the thickness deficiency is 0.01 foot or more and less than 0.05 foot, you may request authorization to leave the pavement in place and accept a pay adjustment. If the deficiency is more than 0.05 foot the pavement must be removed and replaced.

40-1.01D(7)(b)(vii) Pavement Smoothness

Where testing with an IP is required, the pavement surface must have:

1. No areas of localized roughness with an IRI greater than 120 in/mi
2. MRI of 60 in/mi or less within a 0.1 mile section

Where testing with a straightedge is required, 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 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

40-1.01D(7)(b)(viii) Coefficient of Friction

Initial and final texturing must produce a coefficient of friction of at least 0.30. Do not open the pavement to traffic unless the coefficient of friction is at least 0.30.

40-1.01D(7)(b)(ix)–40-1.01D(7)(b)(xii) Reserved

40-1.02 MATERIALS

40-1.02A General

Water for coring must comply with section 90.

Tack coat must comply with section 39.

40-1.02B Concrete

40-1.02B(1) General

PCC for pavement must comply with section 90-1 except as otherwise specified.

40-1.02B(2) Cementitious Material

Concrete must contain from 505 pounds to 675 pounds cementitious material per cubic yard. The specifications for reducing cementitious material content in section 90-1.02E(2) do not apply .

40-1.02B(3) Aggregate

Aggregate must comply with section 90-1.02C except the specifications for reduction in operating range and contract compliance for cleanness value and sand equivalent specified in section 90-1.02C(2) and section 90-1.02C(3) do not apply.

For coarse aggregate in high desert and high mountain climate regions, the loss must not exceed 25 percent when tested under California Test 211 with 500 revolutions.

For combined aggregate gradings, the difference between the percent passing the 3/8-inch sieve and the percent passing the no. 8 sieve must not be less than 16 percent of the total aggregate.

40-1.02B(4) Air Entrainment

The second paragraph of section 90-1.02I(2)(a) does not apply.

For a project shown in the low and south mountain climate regions, add air-entraining admixture to the concrete at the rate required to produce an air content of 4 percent in the freshly mixed concrete.

For a project shown in the high desert and high mountain climate regions, add air-entraining admixture to the concrete at the rate required to produce an air content of 6 percent in the freshly mixed concrete.

40-1.02B(5)–40-1.02B(8) Reserved

40-1.02C Reinforcement, Bars, and Baskets

40-1.02C(1) Bar Reinforcement

Bar reinforcement must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, bar reinforcement must comply with section 52.

If the project is shown to be in high desert or any mountain climate regions, bar reinforcement must be one of the following:

1. Epoxy-coated bar reinforcement under section 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60. Bars must be handled under ASTM D 3963/D 3963M and section 52-2.02C.
2. Low carbon, chromium steel bar complying with ASTM A 1035/A 1035M

40-1.02C(2) Dowel Bars

Dowel bars must be plain bars. Fabricate, sample, and handle epoxy-coated dowel bars under ASTM D 3963/D 3963M and section 52-2.03C except each sample must be 18 inches long.

If the project is not shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with either section 52-2.02B or 52-2.03B.
2. Stainless-steel bars. Bars must be descaled solid stainless-steel bars under ASTM A 955/A 955M, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars under ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with section 52-2.03B.
2. Stainless-steel bars. Bars must be descaled solid stainless-steel bars under ASTM A 955/A 955M, UNS Designation S31603 or S31803.

40-1.02C(3) Tie Bars

Tie bars must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with either section 52-2.02B or 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.
2. Stainless-steel bars. Bars must be descaled solid stainless-steel bars under ASTM A 955/A 955M, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars under ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with section 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.

2. Stainless-steel bars. Bars must be descaled solid stainless-steel bars under ASTM A 955/A 955M, UNS Designation S31603 or S31803.

Fabricate, sample, and handle epoxy-coated tie bars under ASTM D 3963/D 3963M, section 52-2.02, or section 52-2.03.

Do not bend tie bars.

40-1.02C(4) Dowel and Tie Bar Baskets

For dowel and tie bar baskets, wire must comply with ASTM A 82/A 82M and be welded under ASTM A 185/A 185M, Section 7.4. The minimum wire-size no. is W10. Use either U-frame or A-frame shaped assemblies.

If the project is not shown to be in high desert or any mountain climate region, baskets may be epoxy-coated, and the epoxy coating must comply with either section 52-2.02B or 52-2.03B.

If the project is shown to be in high desert or any mountain climate region, wire for dowel bar and tie bar baskets must be one of the following:

1. Epoxy-coated wire complying with section 52-2.03B
2. Stainless-steel wire. Wire must be descaled solid stainless-steel. Wire must comply with (1) the chemical requirements in ASTM A 276/A 276M, UNS Designation S31603 or S31803 and (2) the tension requirements in ASTM A 1022/ A 1022M.

Handle epoxy-coated tie bar and dowel bar baskets under ASTM D 3963/D 3963M and either section 52-2.02 or 52-2.03.

Fasteners must be driven fasteners under ASTM F 1667. Fasteners on lean concrete base or HMA must have a minimum shank diameter of 3/16 inch and a minimum shank length of 2-1/2 inches. For asphalt treated permeable base or cement treated permeable base, the shank diameter must be at least 3/16 inch and the shank length must be at least 5 inches.

Fasteners, clips, and washers must have a minimum 0.2-mil thick zinc coating applied by either electroplating or galvanizing.

40-1.02D Dowel Bar Lubricant

Dowel bar lubricant must be petroleum paraffin based or a curing compound. Paraffin-based lubricant must be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal and must be factory-applied. Curing compound must be curing compound no. 3.

40-1.02E Joint Filler

Joint filler for isolation joint must be preformed expansion joint filler for concrete (bituminous type) under ASTM D 994.

40-1.02F Curing Compound

Curing compound must be curing compound no. 1 or 2.

40-1.02G Nonshrink Hydraulic Cement Grout

Nonshrink hydraulic cement grout must comply with ASTM C 1107/C 1107M. Clean, uniform, rounded aggregate filler may be used to extend the grout. Aggregate filler must not exceed 60 percent of the grout mass or the maximum recommended by the manufacturer, whichever is less. Aggregate filler moisture content must not exceed 0.5 percent when tested under California Test 223 or California Test 226. Aggregate filler tested under California Test 202 must comply with the grading shown in the following table:

Aggregate Filler Grading

Sieve size	Percentage passing
1/2-inch	100
3/8-inch	85–100
No. 4	10–30
No. 8	0–10
No. 16	0–5

40-1.02H Temporary Roadway Pavement Structure

Temporary roadway pavement structure must comply with section 41-1.02E.

40-1.02I–40-1.02N Reserved

40-1.03 CONSTRUCTION

40-1.03A General

Aggregate and bulk cementitious material must be proportioned by weight by means of automatic proportioning devices of approved types.

For widenings and lane reconstruction, construct only the portion of pavement where the work will be completed during the same lane closure. If you fail to complete the construction during the same lane closure, construct a temporary pavement structure under section 41-1.

40-1.03B Water Supply

Before placing concrete pavement, develop enough water supply.

40-1.03C Test Strips

Construct a test strip for each type of pavement with a quantity of more than 2,000 cu yd. Obtain authorization of the test strip before constructing pavement. Test strips must be:

1. 700 to 1,000 feet long
2. Same width as the planned paving, and
3. Constructed using the same equipment proposed for paving

The Engineer selects from 6 to 12 core locations for dowel bars and up to 6 locations for tie bars per test strip. If you use mechanical dowel bar inserters, the test strip must demonstrate they do not leave voids, segregations, or surface irregularities such as depressions, dips, or high areas.

Test strips must comply with the acceptance criteria for:

1. Smoothness, except IP is not required
2. Dowel bars and tie bars placement
3. Pavement thickness
4. Final finishing, except the coefficient of friction is not considered

Allow 3 business days for evaluation. If the test strip is noncompliant, stop paving and submit a plan for changed materials, methods, or equipment. Allow 3 business days for authorization of the plan. Construct another test strip per the authorized plan.

Remove and dispose of noncompliant test strips.

If the test strip is compliant except for smoothness and final finishing, you may grind the surface. After grinding retest the test strip smoothness under section 40-1.01D(6)(c).

If the test strip is compliant for smoothness and thickness, construction of an additional test strip is not required and the test strip may remain in place.

Construct additional test strips if you:

1. Propose different paving equipment including:
   1.1. Paver
   1.2. Dowel bar inserter

1.3. Tie bar inserter
1.4. Tining
1.5. Curing equipment
2. Change concrete mix proportions

You may request authorization to eliminate the test strip if you use paving equipment and personnel from a Department project (1) for the same type of pavement and (2) completed within the past 12 months. Submit supporting documents and previous project information with your request.

40-1.03D Joints

40-1.03D(1) General

Do not bend tie bars or reinforcement in existing concrete pavement joints.

For contraction joints and isolation joints, saw cut a groove with a power-driven saw. After cutting, immediately wash slurry from the joint with water at less than 100 psi pressure.

Keep joints free from foreign material including soil, gravel, concrete, and asphalt. To keep foreign material out of the joint, you may use filler material. Filler material must not react adversely with the concrete or cause concrete pavement damage. After sawing and washing, install filler material that keeps moisture in the adjacent concrete during the 72 hours after paving. If you install filler material, the specifications for spraying the sawed joint with additional curing compound in section 40-1.03K does not apply. If using absorptive filler material, moisten the filler immediately before or after installation.

40-1.03D(2) Construction Joints

Construction joints must be vertical.

Before placing fresh concrete against hardened concrete, existing concrete pavement, or structures, apply curing compound no. 1 or 2 to the vertical surface of the hardened concrete, existing concrete pavement, or structures and allow it to dry.

At joints between concrete pavement and HMA, apply tack coat between the concrete pavement and HMA.

Use a metal or wooden bulkhead to form transverse construction joints. If dowel bars are described, the bulkhead must allow dowel bar installation.

40-1.03D(3) Contraction Joints

Saw contraction joints before cracking occurs and after the concrete is hard enough to saw without spalling, raveling, or tearing.

Saw cut using a power saw with a diamond blade. After cutting, immediately wash slurry from the joint with water at less than 100 psi pressure.

Except for longitudinal joints parallel to a curving centerline, transverse and longitudinal contraction joints must not deviate by more than 0.1 foot from either side of a 12-foot straight line

Cut transverse contraction joints within 0.5 foot of the spacing described. Adjust spacing if needed such that slabs are at least 10 feet long.

For widenings, do not match transverse contraction joints with existing joint spacing or skew unless otherwise described.

Cut transverse contraction joints straight across the full concrete pavement width, between isolation joints and edges of pavement. In areas of converging and diverging pavements, space transverse contraction joints such that the joint is continuous across the maximum pavement width. Longitudinal contraction joints must be parallel with the concrete pavement centerline, except when lanes converge or diverge.

40-1.03D(4) Isolation Joints

Before placing concrete at isolation joints, prepare the existing concrete face and secure joint filler. Prepare by saw cutting and making a clean flat vertical surface. Make the saw cut the same depth as the depth of the new pavement.

40-1.03E Bar Reinforcement

Place bar reinforcement under section 52.

40-1.03F Dowel Bar Placement

If using curing compound as lubricant, apply the curing compound to dowels in 2 separate applications. Lubricate each dowel bar entirely before placement. The last application must be applied not more than 8 hours before placing the dowel bars. Apply each curing compound application at a rate of 1 gallon per 150 square feet.

Install dowel bars using one of the following methods:

1. Drill and bond bars. Comply with section 41-10.
2. Mechanical insertion. Eliminate evidence of the insertion by reworking the concrete over the dowel bars.
3. Dowel bar baskets. Anchor baskets with fasteners. Use at least 1 fastener per foot for basket sections. Baskets must be anchored at least 200 feet in advance of the concrete placement activity unless your waiver request is authorized. If requesting a waiver, describe the construction limitations or restricted access preventing the advanced anchoring. After the baskets are anchored and before the concrete is placed, cut and remove temporary spacer wires and demonstrate the dowel bars do not move from their specified depth and alignment during concrete placement.

If dowel bars are noncompliant, stop paving activities, demonstrate your correction, and obtain verbal approval from the Engineer.

40-1.03G Tie Bar Placement

Install tie bars at longitudinal joints using one of the following methods:

1. Drill and bond bars. Comply with section 41-10.
2. Insert bars. Mechanically insert tie bars into plastic slip-formed concrete before finishing. Inserted tie bars must have full contact between the bar and the concrete. Eliminate evidence of the insertion by reworking the concrete over the tie bars.
3. Threaded couplers. Threaded tie bar splice couplers must be fabricated from deformed bar reinforcement and free of external welding or machining.
4. Tie bar baskets. Anchor baskets at least 200 feet in advance of pavement placement activity. If you request a waiver, describe the construction limitations or restricted access preventing the advanced anchoring. After the baskets are anchored and before paving, demonstrate the tie bars do not move from their specified depth and alignment during paving. Use fasteners to anchor tie bar baskets.

If tie bars are noncompliant, stop paving activities, demonstrate your correction, and obtain verbal approval from the Engineer.

40-1.03H Placing Concrete

40-1.03H(1) General

Immediately prior to placing concrete, the surface to receive concrete must be:

1. In compliance with specified requirements, including compaction and elevation tolerances
2. Free of loose and extraneous material
3. Uniformly moist, but free of standing or flowing water

Place concrete pavement with stationary side forms or slip-form paving equipment.

Place consecutive concrete loads within 30 minutes of each other. Construct a transverse construction joint when concrete placement is interrupted by more than 30 minutes. The transverse construction joint must coincide with the next contraction joint location, or you must remove fresh concrete pavement to the preceding transverse joint location.

Place concrete pavement in full slab widths separated by construction joints or monolithically in multiples of full lane widths with a longitudinal contraction joint at each traffic lane line.

Do not retemper concrete.

If the concrete pavement surface width is constructed as specified, you may construct concrete pavement sides on a batter not flatter than 6:1 (vertical:horizontal).

40-1.03H(2) Paving Adjacent to Existing Concrete Pavement

Where pavement is placed adjacent to existing concrete pavement:

1. Grinding adjacent pavement must be completed before placing the pavement
2. Use paving equipment with padded crawler tracks or rubber-tired wheels with enough offset to prevent damage
3. Match pavement grade with the elevation of existing concrete pavement after grinding.

40-1.03H(3) Concrete Pavement Transition Panel

For concrete pavement placed in a transition panel, texture the surface with a drag strip of burlap, broom, or spring steel tine device that produces scoring in the finished surface. Scoring must be either parallel or transverse to the centerline. Texture at the time that produces the coarsest texture.

40-1.03H(4) Stationary Side Form Construction

Stationary side forms must be straight and without defects including warps, bends, and indentations. Side forms must be metal except at end closures and transverse construction joints where other materials may be used.

You may build up side forms by attaching a section to the top or bottom. If attached to the top of metal forms, the attached section must be metal.

The side form's base width must be at least 80 percent of the specified concrete pavement thickness.

Side forms including interlocking connections with adjoining forms must be rigid enough to prevent springing from subgrading and paving equipment and concrete pressure.

Construct subgrade to final grade before placing side forms. Side forms must bear fully on the foundation throughout their length and base width. Place side forms to the specified grade and alignment of the finished concrete pavement's edge. Support side forms during concrete placing, compacting, and finishing.

After subgrade work is complete and immediately before placing concrete, true side forms and set to line and grade for a distance that avoids delays due to form adjustment.

Clean and oil side forms before each use.

Side forms must remain in place for at least 1 day after placing concrete and until the concrete pavement edge no longer requires protection from the forms.

Spread, screed, shape, and consolidate concrete with 1 or more machines. The machines must uniformly distribute and consolidate the concrete. The machines must operate to place the concrete pavement to the specified cross section with minimal hand work.

Consolidate the concrete without segregation. If vibrators are used:

1. The vibration rate must be at least 3,500 cycles per minute for surface vibrators and 5,000 cycles per minute for internal vibrators
2. Amplitude of vibration must cause perceptible concrete surface movement at least 1 foot from the vibrating element
3. Use a calibrated tachometer for measuring frequency of vibration
4. Vibrators must not rest on side forms or new concrete pavement
5. Power to vibrators must automatically cease when forward or backward motion of the paving machine is stopped
6. Uniformly consolidate the concrete across the paving width including adjacent to forms by using high-frequency internal vibrators within 15 minutes of depositing concrete on the subgrade
7. Do not shift the mass of concrete with vibrators.

40-1.03H(5) Slip-Form Construction

If slip-form construction is used, spread, screed, shape, and consolidate concrete to the specified cross section with slip-form machines and minimal hand work. Slip-form paving machines must be equipped with traveling side forms and must not segregate the concrete.

Do not deviate from the specified concrete pavement alignment by more than 0.1 foot.

Slip-form paving machines must use high frequency internal vibrators to consolidate concrete. You may mount vibrators with their axes parallel or normal to the concrete pavement alignment. If mounted with axes parallel to the concrete pavement alignment, space vibrators no more than 2.5 feet measured center to center. If mounted with axes normal to the concrete pavement alignment, space the vibrators with a maximum 0.5-foot lateral clearance between individual vibrators.

Each vibrator must have a vibration rate from 5,000 to 8,000 cycles per minute. The amplitude of vibration must cause perceptible concrete surface movement at least 1 foot from the vibrating element. Use a calibrated tachometer to measure frequency of vibration.

40-1.03I Edge Treatment

Construct edge treatments as shown. Regrade when required for the preparation of safety edge areas.

Sections 40-1.03J(2) and 40-1.03J(3) do not apply to safety edges.

For safety edges placed after the concrete pavement is complete, concrete may comply with the requirements for minor concrete.

For safety edges placed after the concrete pavement is complete, install connecting bar reinforcement under section 52.

Saw cutting or grinding may be used to construct safety edges.

For safety edges, the angle of the slope must not deviate by more than ± 5 degrees from the angle shown. Measure the angle from the plane of the adjacent finished pavement surface.

40-1.03J Finishing

40-1.03J(1) General

Reserved

40-1.03J(2) Preliminary Finishing

40-1.03J(2)(a) General

Preliminary finishing must produce a smooth and true-to-grade finish. After preliminary finishing, mark each day's paving with a stamp. The stamp must be authorized before paving starts. The stamp must be approximately 1 by 2 feet in size. The stamp must form a uniform mark from 1/8 to 1/4 inch deep. Locate the mark 20 ± 5 feet from the transverse construction joint formed at each day's start of paving and 1 ± 0.25 foot from the pavement's outside edge. The stamp mark must show the month, day, and year of placement and the station of the transverse construction joint. Orient the stamp mark so it can be read from the pavement's outside edge.

Do not apply water to the pavement surface before float finishing.

40-1.03J(2)(b) Stationary Side Form Finishing

If stationary side form construction is used, give the pavement a preliminary finish by the machine float method or the hand method.

If using the machine float method:

1. Use self-propelled machine floats.
2. Determine the number of machine floats required to perform the work at a rate equal to the pavement delivery rate. If the time from paving to machine float finishing exceeds 30 minutes, stop pavement delivery. When machine floats are in proper position, you may resume pavement delivery and paving.
3. Run machine floats on side forms or adjacent pavement lanes. If running on adjacent pavement, protect the adjacent pavement surface under section 40-1.03L. Floats must be hardwood, steel, or

steel-shod wood. Floats must be equipped with devices that adjust the underside to a true flat surface.

If using the hand method, finish pavement smooth and true to grade with manually operated floats or powered finishing machines.

40-1.03J(2)(c) Slip-Form Finishing

If slip-form construction is used, the slip-form paver must give the pavement a preliminary finish. You may supplement the slip-form paver with machine floats.

Before the pavement hardens, correct pavement edge slump in excess of 0.02 foot exclusive of edge rounding.

40-1.03J(3) Final Finishing

After completing preliminary finishing, round the edges of the initial paving widths to a 0.04-foot radius. Round transverse and longitudinal construction joints to a 0.02-foot radius.

Before curing, texture the pavement. Perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with a steel-tined device that produces grooves parallel with the centerline.

Construct longitudinal grooves with a self-propelled machine designed specifically for grooving and texturing pavement. The machine must have tracks to maintain constant speed, provide traction, and maintain accurate tracking along the pavement surface. The machine must have a single row of rectangular spring steel tines. The tines must be from 3/32 to 1/8 inch wide, on 3/4-inch centers, and must have enough length, thickness, and resilience to form grooves approximately 3/16 inch deep. The machine must have horizontal and vertical controls. The machine must apply constant down pressure on the pavement surface during texturing. The machines must not cause raveling.

Construct grooves over the entire pavement width in a single pass except do not construct grooves 3 inches from the pavement edges and longitudinal joints. Final texture must be uniform and smooth. Use a guide to properly align the grooves. Grooves must be parallel and aligned to the pavement edge across the pavement width. Grooves must be from 1/8 to 3/16 inch deep after the pavement has hardened.

For irregular areas and areas inaccessible to the grooving machine, you may hand-construct grooves using the hand method. Hand-constructed grooves must comply with the specifications for machine-constructed grooves.

For ramp termini, use heavy brooming normal to the ramp centerline to produce a coefficient of friction of at least 0.35 determined on the hardened surface under California Test 342.

40-1.03K Curing

Cure the concrete pavement's exposed area under section 90-1.03B using the waterproof membrane method or curing compound method. If using the curing compound method use curing compound no. 1 or 2. When side forms are removed within 72 hours of the start of curing, also cure the concrete pavement edges.

Apply curing compound with mechanical sprayers. Reapply curing compound to saw cuts and disturbed areas.

40-1.03L Protecting Concrete Pavement

Protect concrete pavement under section 90-1.03C.

Maintain the concrete pavement surface temperature at not less than 40 degrees F for the initial 72 hours.

Protect the concrete pavement surface from activities that cause damage and reduce texture and coefficient of friction. Do not allow soil, gravel, petroleum products, concrete, or asphalt mixes on the concrete pavement surface.

Construct crossings for traffic convenience. If authorized, you may use RSC for crossings. Do not open crossings until the Department determines that the pavement's modulus of rupture is at least 550 psi under California Test 523 or California Test 524.

Do not open concrete pavement to traffic or use equipment on the concrete pavement for 10 days after paving nor before the concrete has attained a modulus of rupture of 550 psi based on Department's testing except:

1. If the equipment is for sawing contraction joints
2. If authorized, one side of paving equipment's tracks may be on the concrete pavement after a modulus of rupture of 350 psi has been attained, provided:
   - 2.1. Unit pressure exerted on the concrete pavement by the paver does not exceed 20 psi
   - 2.2. You change the paving equipment tracks to prevent damage or the paving equipment tracks travel on protective material such as planks
   - 2.3. No part of the track is closer than 1 foot from the concrete pavement's edge

If concrete pavement damage including visible cracking occurs, stop operating paving equipment on the concrete pavement and repair the damage.

40-1.03M Early Use of Concrete Pavement

If requesting early use of concrete pavement:

1. Furnish molds and machines for modulus of rupture testing
2. Sample concrete
3. Fabricate beam specimens
4. Test for modulus of rupture under California Test 523

If you request early use, concrete pavement must have a modulus of rupture of at least 350 psi. Protect concrete pavement under section 40-1.03L.

40-1.03N Reserved

40-1.03O Shoulder Rumble Strip

40-1.03O(1) General

Construct shoulder rumble strips by rolling or grinding indentations in new concrete pavement.

Do not construct shoulder rumble strips on structures or approach slabs.

Construct rumble strips within 2 inches of the specified alignment. Rumble strip equipment must be equipped with a sighting device enabling the operator to maintain the rumble strip alignment.

Indentations must not vary from the specified dimensions by more than 1/16 inch in depth nor more than 10 percent in length and width.

Grind or remove and replace noncompliant rumble strip indentations at locations determined by the Engineer. Ground surface areas must be neat and uniform in appearance.

Remove grinding residue under section 42-1.03B.

40-1.03O(2) Rolled-In Indentations

Construct rolled-in indentations before final concrete set. Indentation construction must not displace adjacent concrete.

40-1.03O(3) Ground-In Indentations

Concrete pavement must be hardened before grinding rumble strips indentations. Do not construct indentations until the following occurs:

1. 10 days elapse after concrete placement
2. Concrete has developed a modulus of rupture of 550 psi determined under California Test 523,

40-1.03P Drilling Cores

Drill concrete pavement cores under ASTM C 42/C 42M. Use diamond impregnated drill bits.

Clean, dry, and fill core holes with hydraulic cement grout (nonshrink) or pavement concrete. Coat the core hole walls with epoxy adhesive for bonding new concrete to old concrete under section 95. Finish the backfill to match the adjacent surface elevation and texture.

40-1.03Q Pavement Repair and Replacement

40-1.03Q(1) General

If surface raveling or full-depth cracks occur within one year of Contract acceptance, repair or replace the pavement under section 6-3.06.

Repair and replace pavement in the following sequence:

1. Replace pavement
2. Repair spall, ravel, and working cracks
3. Correct smoothness and coefficient of friction
4. Treat partial depth cracks
5. Replace damaged joint seals under section 41-5

In addition to removing pavement for other noncompliance, remove and replace JPCP slabs that:

1. Have one or more full depth crack
2. Have raveled surfaces such that either:
   - 2.1. Combined raveled areas are more than 5 percent of the total slab area
   - 2.2. Single area is more than 4 sq ft

Remove and replace JPCP 3 feet on both sides of a joint with a rejected dowel bar.

40-1.03Q(2) Spall and Ravel Repair

Repair spalled or raveled areas that are:

1. Deeper than 0.05 foot
2. Wider than 0.10 foot
3. Longer than 0.3 foot

Repairs must comply with section 41-4 and be completed before opening pavement to traffic.

40-1.03Q(3) Crack Repair

Treat partial depth cracks for JPCP under section 41-3.

If the joints are sealed, repair working cracks by routing and sealing. Use a powered rotary router mounted on wheels, with a vertical shaft and a routing spindle that casters as it moves along the crack. Form a reservoir 3/4 inch deep by 3/8 inch wide in the crack. Equipment must not cause raveling nor spalling

Treat the contraction joint adjacent to the working crack by either:

1. Epoxy resin under ASTM C 881/C 881M, Type IV, Grade 2
2. Pressure injecting epoxy resin under ASTM C 881/C881M, Type IV, Grade 1

40-1.03Q(4) Smoothness and Friction Correction

Correct pavement that is noncompliant for:

1. Smoothness by grinding under section 42-3
2. Coefficient of friction by grooving or grinding under section 42

Do not start corrective work until:

1. Pavement has cured 10 days
2. Pavement has at least a 550 psi modulus of rupture
3. Your corrective method is authorized

Correct the entire lane width. Begin and end grinding at lines perpendicular to the roadway centerline. The corrected area must have a uniform texture and appearance.

If corrections are made within areas where testing with an IP is required, retest the entire lane length with an IP under sections 40-1.01D(6)(c) and 40-1.01D(7)(b)(vii).

If corrections are made within areas where testing with a 12-foot straightedge is required, retest the corrected area with a straightedge under sections 40-1.01D(6)(c) and 40-1.01D(7)(b)(vii).

Allow 25 days for the Department's coefficient of friction retesting.

40-1.03R–40-1.03U Reserved

40-1.04 PAYMENT

The payment quantity for pavement is based on the dimensions shown.

The deduction for pavement thickness deficiency in each primary area is shown in the following table:

Deduction for Thickness Deficiency

Average thickness deficiency (foot)[a]	Deduction($/sq yd)
0.01	0.90
0.02	2.30
0.03	4.10
0.04	6.40
0.05	9.11

[a]Values greater than 0.01 are rounded to the nearest 0.01 foot.

Shoulder rumble strips are measured by the station along each shoulder on which the rumble strips are constructed without deductions for gaps between indentations.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel or tie bar coring, the additional cores are paid for as change order work.

The Department does not pay for additional coring to check dowel or tie bar alignment which you request.

If the Engineer accepts a test strip and it remains as part of the paving surface, the test strip is paid for as the type of pavement involved.

If the curvature of a slab affects tie bar spacing and additional tie bars are required, no additional payment is made for the additional tie bars.

Payment for grinding existing pavement is not included in the payment for the type of pavement involved.

40-2 CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

40-2.01 GENERAL

40-2.01A Summary

Section 40-2 includes specifications for constructing CRCP.

Terminal joints include saw cutting, dowel bars, drill and bond dowel bars, support slab, support slab reinforcement, tack coat, and temporary hot mix asphalt.

Expansion joints include polystyrene, support slab, support slab reinforcement, dowel bars, drill and bond dowel bars, and bond breaker.

Wide flange beam terminals include polyethylene foam, support slab, and support slab reinforcement.

Pavement anchors include cross drains, anchor reinforcement, filter fabric, and permeable material.

40-2.01B Definitions

Reserved

40-2.01C Submittals

Reserved

40-2.01D Quality Control and Assurance

40-2.01D(1) General

Reserved

40-2.01D(2) Testing for Coefficient of Thermal Expansion

For field qualification, test coefficient of thermal expansion under AASHTO T 336. The coefficient of thermal expansion must not exceed 6.0 microstrain/degree Fahrenheit.

40-2.02 MATERIALS

40-2.02A General

Class 1 permeable material, filter fabric, and slotted plastic pipe cross drain as shown for pavement anchors must comply with section 68-3.

40-2.02B Concrete

Concrete for terminal joints, support slabs, and pavement anchors must comply with section 40-1.02.

40-2.02C Transverse Bar Assembly

Instead of transverse bar and other support devices, you may use transverse bar assemblies to support longitudinal bar. Bar reinforcement and wire must comply with section 40-1.02C.

40-2.02D Wide Flange Beam

Wide flange beams and studs must be either rolled structural steel shapes under ASTM A 36/A 36M or structural steel under ASTM A 572/A 572M.

40-2.02E Joints

Joint seals for wide flange beam terminals must comply with section 51-2.02.

Joint seals for transverse expansion joints must comply with section 51-2.02.

Expanded polystyrene for transverse expansion joints must comply with section 51-2.01B(1).

40-2.03 CONSTRUCTION

40-2.03A General

Reserved

40-2.03B Test Strips

Comply with section 40-1.03C except during the evaluation, the Engineer visually checks reinforcement, dowel and tie bar placement.

40-2.03C Construction Joints

Transverse construction joints must be perpendicular to the lane line. Construct joints to allow for lap splices of the longitudinal bar. Comply with the lap splice lengths shown for CRCP.

Clean construction joint surfaces before placing fresh concrete against the joint surfaces. Remove surface laitance, curing compound, and other foreign materials.

40-2.03D Bar Reinforcement

Place bar reinforcement under section 52-1.03D, except you may request to use plastic chairs. Plastic chairs will only be considered for support directly under the transverse bars. Your request to use plastic chairs must include a sample of the plastic chair, the manufacturer's written recommendations for the applicable use and load capacity, chair spacing, and your calculation for the load on a chair for the area of bar reinforcement sitting on it. Vertical and lateral stability of the bar reinforcement and plastic chairs must be demonstrated during construction of the test strip. Obtain authorization before using the proposed plastic chairs for work after the test strip is accepted.

For 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.

40-2.03E Wide Flange Beams

Weld stud ends with an electric arc welder completely fusing the studs to the wide flange beam. Replace studs dislodged in shipping or that can be dislodged with a hammer.

40-2.03F Repair and Replacement

40-2.03F(1) General

Requirements for repair of cracks under section 40-1.03Q do not apply to CRCP. High molecular weight methacrylate is not to be applied to cracks in CRCP.

New CRCP will be monitored for 1 year from contract acceptance or relief from maintenance, whichever is less. CRCP that develops raveling areas of 6 inches by 6 inches or greater will require partial depth repair under section 6-3.06. CRCP that develops one or more full-depth transverse cracks with faulting greater than 0.25 inch or one or more full-depth longitudinal cracks with faulting greater 0.50 inch will require full depth repair.

40-2.03F(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 limits of saw depth must be between 2 inches from the surface to 1/2 inch above the longitudinal bars.
2. If each length of the repair boundaries is equal to or greater than 3 ft, additional reinforcement is needed for the repair area. Submit a plan for authorization before starting the repair.

40-2.03F(3) Full Depth Repair

40-2.03F(3)(a) General

Removal of CRCP must be full depth except for portion of reinforcement to remain. Provide continuity of reinforcement. Comply with section 52-6. Submit a plan for authorization, before starting the repair. Do not damage the base, concrete and reinforcement to remain. Place concrete in the removal area.

40-2.03F(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.

40-2.03F(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 the ends of the crack. You may propose alternate limits with your repair plan for authorization.

40-2.03G Reserved

40-2.04 PAYMENT

Not Used

40-3 RESERVED

40-4 JOINTED PLAIN CONCRETE PAVEMENT

40-4.01 GENERAL

40-4.01A Summary

Section 40-4 includes specifications for constructing JPCP.

40-4.01B Definitions

Reserved

40-4.01C Submittals

40-4.01C(1) General

Reserved

40-4.01C(2) Early Age Crack Mitigation System

At least 24 hours before each paving shift, submit the following information as an informational submittal:

1. Early age stress and strength predictions

2. Scheduled sawing and curing activities
3. Contingency plan if cracking occurs

40-4.01C(3)–40-4.01C(8) Reserved

40-4.01D Quality Control and Assurance

40-4.01D(1) General

Reserved

40-4.01D(2) Quality Control Plan

The QC plan must include a procedure for identifying transverse contraction joint locations relative to the dowel bars longitudinal center and a procedure for consolidating concrete around the dowel bars.

40-4.01D(3) Early Age Crack Mitigation System

For JPCP, develop and implement a system for predicting stresses and strength during the initial 72 hours after paving. The system must include:

1. Subscription to a weather service to obtain forecasts for wind speed, ambient temperatures, humidity, and cloud cover
2. Portable weather station with an anemometer, temperature and humidity sensors, located at the paving site
3. Early age concrete pavement stress and strength prediction plan
4. Analyzing, monitoring, updating, and reporting the system's predictions

40-4.01D(4)–40-4.01D(9) Reserved

40-4.02 MATERIALS

Not Used

40-4.03 CONSTRUCTION

40-4.03A General

Transverse contraction joints on a curve must be on a single straight line through the curve's radius point. If transverse joints do not align in a curve, drill a full depth 2” diameter hole under ASTM C 42/C 42M where the joint meets the adjacent slab. Fill the hole with joint filler. If joints are not sealed, avoid joint filler material penetration into the joint.

40-4.03B Repair and Replacement

If replacing concrete, saw cut and remove to full depth.

Saw cut full slabs at the longitudinal and transverse joints. Saw cut partial slabs at joints and at locations determined by the Engineer. Saw cut must be vertical.

After lifting the slab, paint the cut ends of dowels and tie bars.

Construct transverse and longitudinal construction joints between the new slab and existing concrete. If slabs are constrained at both longitudinal edges by existing pavement, use dowel bars instead of tie bars. For longitudinal joints, offset dowel bar holes from original tie bars by 3 inches. For transverse joints, offset dowel bar holes from the original dowel bar by 3 inches.

Drill and bond bars to the existing concrete. Comply with section 41-10. Clean the faces of joints and underlying base from loose material and contaminants. Coat the faces with a double application of pigmented curing compound under section 28-2.03F. For partial slab replacements, place preformed sponge rubber expansion joint filler at new transverse joints under ASTM D 1752. Place concrete in the removal area.

40-4.03C–40-4.03G Reserved

40-4.04 PAYMENT

Not Used

40-5 JOINTED PLAIN CONCRETE PAVEMENT WITH RAPID STRENGTH CONCRETE

Reserved

40-6–40-15 RESERVED

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41 CONCRETE PAVEMENT REPAIR

07-19-13

Replace the headings and paragraphs in section 41 with:

07-19-13

41-1 GENERAL

41-1.01 GENERAL

41-1.01A Summary

Section 41-1 includes general specifications for repairing concrete pavement.

Dowel bars must comply with section 40-1.

41-1.01B Definitions

Reserved

41-1.01C Submittals

At least 15 days before delivering fast-setting concrete, polyester resin binder, or bonding agent to the job site, submit the manufacturer's recommendations, instructions, and MSDS. Notify the Engineer if polyester resin binder will be stored in containers over 55 gallons.

41-1.01D Quality Control and Assurance

41-1.01D(1) General

Before using polyester concrete, allow 14 days for sampling and testing of the polyester resin binder.

41-1.01D(2) Reserved

41-1.02 MATERIALS

41-1.02A General

Water for washing aggregates, mixing concrete, curing, and coring must comply with section 90-1.02D.

Use the minimum amount of water to produce workable concrete and comply with the manufacturer's instructions.

41-1.02B Fast-Setting Concrete

Fast-setting concrete must be one of the following:

1. Magnesium phosphate concrete that is either:
   1.1. Single component water activated
   1.2. Dual component with a prepackaged liquid activator
2. Modified high-alumina based concrete
3. Portland cement based concrete

Fast-setting concrete must be stored in a cool and dry environment.

If used, the addition of retarders must comply with the manufacturer's instructions.

You may use any accelerating chemical admixtures complying with ASTM C494/C494M, Type C and section 90-1.02E.

Fast-setting concrete properties must have the values shown in the following table:

Fast-Setting Concrete

Property	Test method	Value
Compressive strength[a] (psi, min)		
at 3 hours	California Test 551	3,000
at 24 hours	California Test 551	5,000
Flexural strength[a] (psi, min, at 24 hours)	California Test 551	500
Bond strength[a] (psi, min, at 24 hours)		
Saturated surface dry concrete	California Test 551	300
Dry concrete	California Test 551	400
Water absorption (%, max)	California Test 551	10
Abrasion resistance[a] (g, max, at 24 hours)	California Test 550	25
Drying shrinkage (%, max, at 4 days)	ASTM C596	0.13
Water soluble chlorides[b] (%, max, by weight)	California Test 422	0.05
Water soluble sulfates[b] (%, max, by weight)	California Test 417	0.25
Thermal stability (%, min)	California Test 553	90

[a]Perform test with aggregate filler if used.
[b]Test must be performed on a cube specimen, fabricated under California Test 551, cured at least 14 days, and then pulverized to 100% passing the no. 50 sieve.

Aggregate filler may be used to extend prepackaged concrete. Aggregate filler must:

1. Be clean and uniformly rounded.
2. Have a moisture content of 0.5-percent by weight or less when tested under California Test 226.
3. Comply with sections 90-1.02C(2) and 90-1.02C(3).
4. Not exceed 50 percent of the concrete volume or the maximum recommended by the fast-setting concrete manufacturer, whichever is less.

When tested under California Test 202, aggregate filler must comply with the grading in the following table:

Aggregate Filler Grading

Sieve size	Percentage passing
3/8 inch	100
No. 4	50–100
No. 16	0–5

41-1.02C Polyester Concrete

Polyester concrete consists of polyester resin binder and dry aggregate. The polyester resin binder must be an unsaturated isophthalic polyester-styrene copolymer.

Polyester resin binder properties must have the values shown in the following table:

Polyester Resin Binder

Property	Test method	Value
Viscosity[a] (Pa·s) RVT, No. 1 spindle, 20 RPM at 77 °F	ASTM D2196	0.075–0.200
Specific gravity[a] (77 °F)	ASTM D1475	1.05–1.10
Elongation (%, min) Type I specimen, 0.25 ± 0.03 inch thick Speed of testing = 0.45 inch/minute Condition 18/25/50+5/70: T—23/50	ASTM D638 ASTM D618	35
Tensile strength (psi, min) Type I specimen, 0.25 ± 0.03 inch thick Speed of testing = 0.45 inch/minute Condition 18/25/50+5/70: T—23/50	ASTM D638 ASTM D618	2,500
Styrene content[a] (%, by weight)	ASTM D2369	40–50
Silane coupler (%, min, by weight of polyester resin binder)	--	1.0
PCC saturated surface-dry bond strength at 24 hours and 70 ± 2 °F (psi, min)	California Test 551	500
Static volatile emissions[a] (g/sq m, max)	South Coast Air Quality Management District, Method 309-91[b]	60

[a]Perform the test before adding initiator.
[b]For the test method, go to:
http://www.aqmd.gov/tao/methods/lab/309-91.pdf

Silane coupler must be an organosilane ester, gamma-methacryloxypropyltrimethoxysilane. Promoter must be compatible with suitable methyl ethyl ketone peroxide (MEKP) and cumene hydroperoxide (CHP) initiators.

Aggregate for polyester concrete must comply with section 90-1.02C(1), 90-1.02C(2), and 90-1.02C(3).

When tested under California Test 202, the combined aggregate grading must comply with one of the gradations in the following table:

Combined Aggregate Grading

Sieve size	Percentage passing		
	A	B	C
1/2"	100	100	100
3/8"	83–100	100	100
No. 4	65–82	62–85	45–80
No. 8	45–64	45–67	35–67
No. 16	27–48	29–50	25–50
No. 30	12–30	16–36	15–36
No. 50	6–17	5–20	5–20
No. 100	0–7	0–7	0–9
No. 200	0–3	0–3	0–6

Aggregate retained on the no. 8 sieve must have a maximum of 45 percent crushed particles under California Test 205. Fine aggregate must be natural sand.

The weighted average absorption must not exceed 1 percent when tested under California Tests 206 and 207.

You may submit an alternative grading or request to use manufactured sand as fine aggregate but 100 percent of the combined grading must pass the 3/8 inch sieve. Allow 21 days for authorization.

Polyester concrete must have a minimum compressive strength of 1250 psi at 3 hours and 30 minutes under California Test 551 or ASTM C109.

41-1.02D Bonding Agent

Bonding agent must comply with the concrete manufacturer's recommendations.

41-1.02E Temporary Pavement Structure

Temporary pavement structure consists of RSC or aggregate base with HMA. RSC not conforming to the specifications may serve as temporary pavement structure if:

1. The modulus of rupture is at least 200 psi before opening to traffic
2. RSC thickness is greater than or equal to the existing concrete pavement surface layer
3. RSC is replaced during the next paving shift

Aggregate base for temporary pavement structure must comply with the 3/4-inch maximum grading specified in section 26-1.02B.

HMA must comply with section 39-1.15 except do not use HMA Type B.

41-1.02F Reserved

41-1.03 CONSTRUCTION

41-1.03A General

Repair only the portion of pavement where the work will be completed during the same lane closure. If removal is required, remove only the portion of pavement where the repair will be completed during the same traffic closure. Completion of concrete repair includes curing until the concrete attains the specified minimum properties required before opening the repaired pavement to traffic.

If you fail to complete the concrete pavement repair during the same lane closure, construct temporary pavement before opening the lane to traffic.

Before starting repair work, except saw cutting: the equipment, materials, and personnel for constructing temporary pavement structure must be at the job site or an approved location. If HMA can be delivered to the job site within 1 hour, you may request 1-hour delivery as an alternative to having the HMA at the job site.

Maintain the temporary pavement structure and replace it as a first order of work as soon as you resume concrete pavement repair work.

After removing temporary pavement structure, you may stockpile that aggregate base at the job site and reuse it for temporary pavement structure.

41-1.03B Mixing and Applying Bonding Agent

Mix and apply the bonding agent at the job site under the manufacturer's instructions and in small quantities.

Apply bonding agent after cleaning the surface and before placing concrete.

Apply a thin, even coat of bonding agent with a stiff bristle brush until the entire repair surface is scrubbed and coated with bonding agent.

41-1.03C Mixing Concrete

41-1.03C(1) General

Mix concrete in compliance with the manufacturer's instructions. For repairing spalls, mix in a small mobile drum or paddle mixer. Comply with the manufacturer's recommended limits for the quantity of aggregate filler, water, and liquid activator.

Mix the entire contents of prepackaged dual-component magnesium phosphate concrete as supplied by the manufacturer. Use the full amount of each component and do not add water to dual-component magnesium phosphate concrete.

Magnesium phosphate concrete must not be mixed in containers or worked with tools containing zinc, cadmium, aluminum, or copper.

Modified high-alumina based concrete must not be mixed in containers or worked with tools containing aluminum.

41-1.03C(2) Polyester Concrete

When mixing with resin, the moisture content of the combined aggregate must not exceed 1/2 of the average aggregate absorption when tested under California Test 226.

Proportion the polyester resin and aggregate to produce a mixture with suitable workability for the intended work. Only a minimal amount of resin may rise to the surface after finishing.

41-1.03D Placing Concrete

The pavement surface temperature must be at least 40 degrees F before placing concrete. You may propose methods to heat the surfaces.

Place magnesium phosphate concrete on a dry surface.

Place portland cement 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.

Do not retemper concrete. Use dry finishing tools cleaned with water before working the concrete.

41-1.03E Curing Concrete

Cure concrete under the manufacturer's instructions. When curing compound is used, comply with section 90-1.03B for curing compound no. 1 or 2.

41-1.03F Reserved

41-1.04 PAYMENT

Not Used

41-2 SUBSEALING AND JACKING

41-2.01 GENERAL

41-2.01A Summary

Section 41-2 includes specifications for filling voids under existing concrete pavement.

41-2.01B Definitions

Reserved

41-2.01C Submittals

Submit shipping invoices with packaged or bulk fly ash and cement.

Before grouting activities begin, submit a proposal for the materials to be used. Include authorized laboratory test data for the grout indicating:

1. Time of initial setting under ASTM C266.
2. Compressive strength results at 1, 3, and 7 days for 10, 12, and 14-second grout efflux times.

If requesting a substitution of grout materials, submit a proposal that includes test data.

41-2.01D Quality Control and Assurance

Reserved

41-2.02 MATERIALS

41-2.02A General

Reserved

41-2.02B Grout

Grout must consist of Type II portland cement, fly ash, and water. Use from 2.4 to 2.7 parts fly ash to 1 part portland 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 in section 90-1.02B(2).

Fly ash must comply with AASHTO M 295, Class C or Class F. Fly ash sources must be on the Authorized Material List.

You may use chemical admixtures and calcium chloride. Chemical admixtures must comply with section 90-1.02E(2). Calcium chloride must comply with ASTM D98.

Test grout compressive strength under California Test 551, Part 1 at 7-days with 12 seconds efflux time. Follow the procedures for moist cure. The 7-day compressive strength must be at least 750 psi.

41-2.02C Mortar

Mortar must be a prepackaged fast-setting mortar that complies with ASTM C928.

41-2.02D Reserved

41-2.03 CONSTRUCTION

41-2.03A General

Drill holes in the pavement, inject grout, plug the holes, and finish the holes with mortar.

Drill holes through the pavement and underlying base to a depth from 15 to 18 inches below the pavement surface. The hole diameter must match the fitting for the grout injecting equipment.

41-2.03B Injecting Grout

41-2.03B(1) General

Inject grout within 2 days of drilling holes.

Immediately before injecting grout, clean the drilled holes with water at a minimum pressure of 40 psi. The cleaning device must have at least 4 jets that direct water horizontally at the slab-base interface.

Do not inject grout if the atmospheric or subgrade temperature is below 40 degrees F. Do not inject grout in inclement weather. If water is present in the holes, obtain the Engineer's authorization before injecting grout.

Do not inject grout until at least 2 consecutive slabs requiring subsealing are drilled ahead of the grouting activities.

The grout plant must have a positive displacement cement injection pump and a high-speed colloidal mixer capable of operating from 800 to 2,000 rpm. The injection pump must sustain 150 psi if pumping grout with a 12-second efflux time. A pressure gauge must be located immediately adjacent to the supply valve of the grout hose supply valve and positioned for easy monitoring.

Before mixing, weigh dry cement and fly ash if delivered in bulk. If the materials are packaged, each container must weigh the same.

Introduce water to the mixer through a meter or scale.

Inject grout under pressure until the voids under the pavement slab are filled. The injection nozzle must not leak. Do not inject grout if the nozzle is below the bottom of the slab. Inject grout 1 hole at a time.

Stop injecting grout in a hole if either:

1. Grout does not flow under a sustained pump gauge pressure of 150 psi after 7 seconds and there is no indication the slab is moving.
2. Injected grout rises to the surface at any joint or crack, or flows into an adjacent hole.

Dispose of unused grout within 1 hour of mixing.

41-2.03B(2) Subsealing

If a slab raises more than 1/16 inch due to grout injection, stop injecting grout in that hole.

41-2.03B(3) Jacking

The positive displacement pump used for grout injection must be able to provide a sustained gauge pressure of 200 psi. Gauge pressures may be from 200 to 600 psi for brief periods to start slab movement.

You may add additional water to initiate pressure injection of grout. Do not reduce the grout efflux time below 10 seconds.

Raise the slabs uniformly. Use string lines to monitor the pavement movement.

Do not move adjacent slabs not specified for pavement jacking. If you move adjacent slabs, correct the grade within the tolerances for final pavement elevation.

41-2.03B(4) Finishing

Immediately after removing the injection nozzle, plug the hole with a round, tapered wooden plug. Do not remove plugs until adjacent holes are injected with grout and no grout surfaces through previously injected holes.

After grouting, remove grout from drilled holes at least 4 inches below the pavement surface. Clean holes and fill with mortar. Finish filled holes flush with the pavement surface.

41-2.03B(5) Tolerances

The final pavement elevation must be within 0.01 foot of the required grade. If the final pavement elevation is between 0.01 and 0.10 foot higher than the required grade, grind the noncompliant pavement surface under section 42 to within 0.01 foot of the required grade.

If the final pavement elevation is higher than 0.10 foot from the required grade, remove and replace the noncompliant pavement under section 41-9.

41-2.04 PAYMENT

The payment quantity for subsealing is calculated by adding the dry weight of cement and fly ash used for the placed grout. The payment quantity for jacking is calculated by adding the dry weight of cement and fly ash used for the placed grout.

The Department does not pay for wasted grout.

The Department does not adjust the unit price for an increase or decrease in the subsealing quantity.

The Department does not adjust the unit price for an increase or decrease in the jacking quantity.

41-3 CRACK TREATMENT

41-3.01 GENERAL

41-3.01A Summary

Section 41-3 includes specifications for applying high-molecular-weight methacrylate (HMWM) to concrete pavement surface cracks that do not extend the full slab depth.

41-3.01B Definitions

Reserved

41-3.01C Submittals

41-3.01C(1) General

Submit HMWM samples 20 days before use.

If sealant is to be removed, submit the proposed removal method at least 7 days before sealant removal. Do not remove sealant until the proposed sealant removal method is authorized.

41-3.01C(2) Public Safety and Placement Plans

Before starting crack treatment, submit a public safety plan for HMWM and a placement plan for construction activity as shop drawings.

The public safety and placement plans must identify the materials, equipment, and methods to be used.

In the public safety plan, include the MSDS for each component of HMWM and details for:

1. Shipping
2. Storage
3. Handling
4. Disposal of residual HMWM and containers

If the project is in an urban area adjacent to a school or residence, the public safety plan must also include an airborne emissions monitoring plan prepared by a CIH certified in comprehensive practice by the American Board of Industrial Hygiene. Submit a copy of the CIH's certification. The CIH must monitor the emissions at a minimum of 4 points including the mixing point, the application point, and the point of nearest public contact. At work completion, submit a report by the industrial hygienist with results of the airborne emissions monitoring plan.

The placement plan must include:

1. Crack treatment schedule including coefficient of friction testing
2. Methods and materials including:
    - 2.1. Description of equipment for applying HMWM
    - 2.2. Description of equipment for applying sand
    - 2.3. Gel time range and final cure time for resin

Revise rejected plans and resubmit. With each plan rejection, the Engineer gives revision directions including detailed comments in writing. The Engineer notifies you of a plan's acceptance or rejection within 2 weeks of receiving that plan.

41-3.01C(3) Reserved

41-3.01D Quality Control and Assurance

41-3.01D(1) General

Use test tiles to evaluate the HMWM cure time. Coat at least one 4 by 4 inch smooth glazed tile for each batch of HMWM. Place the coated tile adjacent to the area being treated. Do not apply sand to the test tiles.

Use the same type of crack treatment equipment for testing and production.

41-3.01D(2) Test Area

Before starting crack treatment, treat a test area of at least 500 square feet within the project limits at a location accepted by the Engineer. Use test areas outside the traveled way if available.

Treat the test area under weather and pavement conditions similar to those expected during crack treatment production.

The Engineer evaluates the test area based on the acceptance criteria. Do not begin crack treatment until the Engineer accepts the test area.

41-3.01D(3) Reserved

41-3.01D(4) Acceptance Criteria

The Engineer accepts a treated area if:

1. Corresponding test tiles are dry to the touch
2. Treated surface is tack-free and not oily
3. Sand cover adheres enough to resist hand brushing
4. Excess sand is removed
5. Coefficient of friction is at least 0.30 when tested under California Test 342

41-3.02 MATERIALS

HMWM consists of compatible resin, promoter, and initiator. HMWM resin may be prepromoted by mixing promoter and resin together before filling containers. Identify prepromoted resin on the container label.

Adjust the gel time to compensate for temperature changes throughout the application.

HMWM resin properties must have the following values:

Property	Test method	Value
Viscosity [a] (cP, max, Brookfield RVT with UL adapter, 50 RPM at 77 °F)	ASTM D2196	25
Specific gravity[a] (min, at 77 °F)	ASTM D1475	0.90
Flash point [a] (°F, min)	ASTM D3278	180
Vapor pressure[a] (mm Hg, max, at 77 °F)	ASTM D323	1.0
Tack-free time (minutes, max, at 77 °F)	Specimen prepared under California Test 551	400
Volatile content[a] (%, max)	ASTM D2369	30
PCC saturated surface-dry bond strength (psi, min, at 24 hours and 77 ± 2 °F)	California Test 551	500

[a]Perform the test before adding initiator.

Sand must be commercial quality dry blast sand. At least 95 percent of the sand must pass the no. 8 sieve and at least 95 percent must be retained on the no. 20 sieve when tested under California Test 202.

41-3.02D Reserved

41-3.03 CONSTRUCTION

41-3.03A General

Before applying HMWM, clean the pavement surface by abrasive blasting and blow loose material from visible cracks with high-pressure air. Remove concrete curing seals from the pavement to be treated. The pavement must be dry when blast cleaning is performed. If the pavement surface becomes contaminated before applying the HMWM, clean the pavement surface by abrasive blasting.

If performing abrasive blasting within 10 feet of a lane occupied by traffic, operate abrasive blasting equipment with a concurrently operating vacuum attachment.

During pavement treatment, protect pavement joints, working cracks, and surfaces not being treated.

The equipment applying HMWM must combine the components by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars must not cause atomization. Do not use compressed air to produce the spray. Use a shroud to enclose the spray bar apparatus.

You may apply HMWM manually to prevent overspray onto adjacent traffic. If applying resin manually, limit the batch quantity of HMWM to 5 gallons.

Apply HMWM at a rate of 90 square feet per gallon. The prepared area must be dry and the surface temperature must be from 50 to 100 degrees F while applying HMWM. Do not apply HMWM if the ambient relative humidity is more than 90 percent.

Protect existing facilities from HMWM. Repair or replace existing facilities contaminated with HMWM at your expense.

Flood the treatment area with HMWM to penetrate the pavement and cracks. Apply HMWM within 5 minutes after complete mixing. Mixed HMWM viscosity must not increase. Redistribute excess material with squeegees or brooms within 10 minutes of application. Remove excess material from tined grooves.

Wait at least 20 minutes after applying HMWM before applying sand. Apply sand at a rate of approximately 2 pounds per square yard or until refusal. Remove excess sand by vacuuming or sweeping.

Do not allow traffic on the treated surface until:

1. Treated surface is tack-free and non-oily
2. Sand cover adheres enough to resist hand brushing
3. Excess sand is removed
4. Coefficient of friction is at least 0.30 determined under California Test 342

41-3.04 PAYMENT

Not Used

41-4 SPALL REPAIR

41-4.01 GENERAL

Section 41-4 includes specifications for repairing spalls in concrete pavement.

41-4.02 MATERIALS

Repair spalls using polyester concrete with a bonding agent. The bonding agent must comply with the requirements for HMWM in section 41-3.02 except tack-free time requirements do not apply and the HMWM must not contain wax.

Form board must be corrugated cardboard with a 6-mil polyethylene covering.

41-4.03 CONSTRUCTION

41-4.03A General

Prepare spall areas by removing concrete and cleaning. Use a form board to provide compression relief at joints and cracks.

After completing spall repairs do not allow traffic on the repairs for at least 2 hours after the time of final setting under ASTM C403/403M.

41-4.03B Remove Pavement

The Engineer determines the rectangular limits of unsound concrete pavement. Before removing pavement, mark the saw cut lines and spall repair area on the pavement surface.

Do not remove pavement until the Engineer verbally authorizes the saw cut area.

Use a power-driven saw with a diamond blade.

Remove pavement as shown and:

1. From the center of the repair area towards the saw cut
2. To the full saw cut depth
3. At least 2 inches beyond the saw cut edge to produce a rough angled surface

Produce a rough surface by chipping or other removal methods that do not damage the pavement remaining in-place. Completely remove any saw overcuts. Pneumatic hammers used for concrete removal must weigh 15 lbs or less.

If you damage concrete pavement outside the removal area, enlarge the area to remove the damaged pavement.

If dowel bars are exposed during removal, remove concrete from the exposed surface and cover with duct tape.

41-4.03C Cleaning

After pavement has been removed, clean the exposed faces of the concrete by:

1. Sand or water blasting. Water blasting equipment must be capable of producing a blast pressure of 3,000 to 6,000 psi.

2. Blowing the exposed concrete area with compressed air free of moisture and oil to remove debris after blasting. Air compressors must deliver air at a minimum of 120 cfm and develop 90 psi of nozzle pressure.

41-4.03D Form Board Installation

After cleaning, place the form board to match the existing joint or crack alignment. Extend the form board at least 3 inches beyond each end of the repair and at least 1 inch deeper than the repair. Remove the form board before sealing joints or cracks.

41-4.03E–41-4.03I Reserved

41-4.04 PAYMENT

Payment is calculated based on the authorized saw cut area.

The Department does not adjust the unit price for an increase or decrease in the spall repair quantity.

41-5 JOINT SEALS

41-5.01 GENERAL

41-5.01A Summary

Section 41-5 includes specifications for sealing concrete pavement joints or replacing existing concrete pavement joint seals. Pavement joints include isolation joints.

41-5.01B Definitions

Reserved

41-5.01C Submittals

At least 15 days before delivery to the job site, submit a certificate of compliance, MSDS, manufacturer's recommendations, and instructions for storage and installation of:

1. Liquid joint sealant.
2. Backer rods. Include the manufacturer data sheet verifying compatibility with the liquid joint sealant.
3. Preformed compression joint seal. Include the manufacturer data sheet used to verify the seal for the joint dimensions shown.
4. Lubricant adhesive.

Asphalt rubber joint sealant containers must comply with ASTM D6690. Upon delivery of asphalt rubber joint sealant to the job site, submit a certified test report for each lot based on testing performed within 12 months.

Submit a work plan for removing pavement and joint materials. Allow 10 days for authorization. Include descriptions of the equipment and methods for removal of existing pavement and joint material.

41-5.01D Quality Control and Assurance

41-5.01D(1) General

Before sealing joints, arrange for a representative from the manufacturer to provide training on cleaning and preparing the joint and installing the liquid joint sealant or preformed compression joint seal. Do not seal joints until your personnel and the Department's personnel have been trained.

The Engineer accepts joint seals based on constructed dimensions and visual inspection of completed seals for voids.

41-5.01D(2) Reserved

41-5.02 MATERIALS

41-5.02A General

Use the type of seal material described.

Silicone or asphalt rubber joint sealant must not bond or react with the backer rod.

41-5.02B Silicone Joint Sealant

Silicone joint sealant must be on the Authorized Material List.

41-5.02C Asphalt Rubber Joint Sealant

Asphalt rubber joint sealant must:

1. Be paving asphalt mixed with not less than 10 percent ground rubber by weight. Ground rubber must be vulcanized or a combination of vulcanized and devulcanized materials that pass a no. 8 sieve.
2. Comply with ASTM D6690 for Type II.
3. Be capable of melting at a temperature below 400 degrees F and applied to cracks and joints.

41-5.02D Backer Rods

Backer rods must:

1. Comply with ASTM D5249:
   1.1. Type 1 for asphalt rubber joint sealant
   1.2. Type 1 or Type 3 for silicone joint sealant
2. Be expanded, closed-cell polyethylene foam
3. Have a diameter at least 25 percent greater than the saw cut joint width

41-5.02E Preformed Compression Joint Seals

Preformed compression joint seals must:

1. Comply with ASTM D2628
2. Have 5 or 6 cells, except seals 1/2 inch wide or less may have 4 cells

Lubricant adhesive used to install seals must comply with ASTM D2835.

41-5.02F–41-5.02K Reserved

41-5.03 CONSTRUCTION

41-5.03A General

If joint sealing is described for new concrete pavement, do not start joint sealing activities until the pavement has been in place for at least 7 days. Seal new concrete pavement joints at least 7 days after concrete pavement placement if shown.

Remove existing pavement and joint material by sawing, rectangular plowing, cutting, or manual labor. Saw cut the reservoir before cleaning the joint. Use a power-driven saw with a diamond blade.

If you damage a portion of the pavement to remain in place, repair the pavement under section 41-4.

41-5.03B Joint Cleaning

41-5.03B(1) General

Clean the joint after removal and any repair is complete before installing joint seal material. Cleaning must be completed no more than 4 hours before installing backer rods, liquid joint seal, or preformed compression seals using the following sequence:

1. Removing debris
2. Drying
3. Sandblasting
4. Air blasting
5. Vacuuming

Clean in 1 direction to minimize contamination of surrounding areas.

41-5.03B(2) Removing Debris

Remove debris including dust, dirt, and visible traces of old sealant from the joint after sawing, plowing, cutting, or manual removal. Do not use chemical solvents to wash the joint.

41-5.03B(3) Drying

After removing debris, allow the reservoir surfaces to dry or remove moisture and dampness at the joint with compressed air that may be moderately hot.

41-5.03B(4) Sandblasting

After the joint is dry, sandblast the reservoir to remove remaining residue using a 1/4-inch diameter nozzle and 90 psi minimum pressure. Do not sandblast straight into the reservoir. Angle the sandblasting nozzle within 1 to 2 inches from the concrete and make at least 1 pass to clean each reservoir face.

41-5.03B(5) Air Blasting

After sandblasting, air blast the reservoir to remove sand, dirt, and dust 1 hour before sealing the joint. Use compressed air free of oil and moisture delivered at a minimum rate of 120 cfm and 90 psi nozzle pressure.

41-5.03B(6) Vacuuming

After air blasting, use a vacuum sweeper to remove debris and contaminants from the pavement surfaces surrounding the joint.

41-5.03B(7) Reserved

41-5.03C Installing Liquid Joint Sealant

Where backer rods are shown, place the rods before installing liquid joint sealant. Place backer rods under the manufacturer's instructions unless otherwise specified. The pavement and reservoir surfaces must be dry and the ambient air temperature must be at least 40 degrees F and above the dew point. The reservoir surface must be free of residue or film. Do not puncture the backer rod.

Immediately after placing the backer rod, install liquid joint sealant under the manufacturer's instructions unless otherwise specified. Before installing, demonstrate that fresh liquid sealant is ejected from the nozzle free of cooled or cured material. For asphalt rubber joint sealant, the pavement surface temperature must be at least 50 degrees F before installing.

Pump liquid joint sealant through a nozzle sized for the width of the reservoir so that liquid joint sealant is placed directly onto the backer rod. The installer must draw the nozzle toward his body and extrude liquid joint sealant evenly. Liquid joint sealant must maintain continuous contact with the reservoir walls during extrusion.

After placing liquid joint sealant, recess it to the depth shown within 10 minutes of installation and before a skin begins to form.

After each joint is sealed, remove excess liquid joint sealant on the pavement surface. Do not allow traffic over the sealed joints until the liquid joint sealant is set, tack free, and firm enough to prevent embedment of roadway debris.

41-5.03D Installing Preformed Compression Joint Seals

Install preformed compression joint seals using lubricant adhesive as shown and under the manufacturer's instructions.

Install longitudinal seals before transverse seals. Longitudinal seals must be continuous except splicing is allowed at intersections with transverse seals. Transverse seals must be continuous for the entire transverse length of concrete pavement except splices are allowed for widening and staged construction. With a sharp instrument, cut across the longitudinal seal at the intersection with transverse construction joints. If the longitudinal seal does not relax enough to properly install the transverse seal, trim the longitudinal seal to form a tight seal between the 2 joints.

If splicing is authorized, comply with the manufacturer's instructions.

Use a machine specifically designed for preformed compression joint seal installation. The machine must install the seal:

1. To the specified depth
2. To make continuous contact with the joint walls
3. Without cutting, nicking, or twisting the seal
4. Without stretching the seal more than 4 percent

Cut preformed compression joint seal material to the exact length of the pavement joint to be sealed. The Engineer measures this length. After you install the preformed compression joint seal, the Engineer

measures the excess length of material at the joint end. The Engineer divides the excess length by the measured cut length to determine the stretch percentage.

Seals must be compressed from 30 to 50 percent of the joint width when complete in place.

41-5.03E Reserved

41-5.04 PAYMENT

Not Used

41-6 CRACK AND SEAT

41-6.01 GENERAL

41-6.01A Summary

Section 41-6 includes specifications for cracking, seating, and preparing the surface of existing concrete pavement.

41-6.01B Definitions

Reserved

41-6.01C Submittals

Submit each core in a plastic bag or tube for acceptance at the time of sampling. Mark each core with a location description.

41-6.01D Quality Control and Assurance

41-6.01D(1) General

If cracking is noncompliant:

1. Stop crack and seat work
2. Modify your equipment and procedures and crack the noncompliant pavement again
3. Construct another test section
4. Take additional core samples to verify compliance
5. Construct an inspection strip if the concrete pavement has HMA on the surface

41-6.01D(2) Test Section

The Engineer determines and marks a test section up to 1000 square feet within the crack and seat area shown. Construct the test section and obtain the Engineer's verbal authorization before starting crack and seat work.

Immediately before cracking the test section, apply water to the pavement surface so that cracking can be readily evaluated. Crack the test section and vary impact energy and striking patterns to verify your procedure.

41-6.01D(3) Coring

Drill cores at least 6 inches in diameter under ASTM C42 to verify cracking in the Engineer’s presence. Take at least 2 cores per test section and 1 core per lane mile for each pavement cracking machine used. The Engineer determines the core locations.

41-6.01D(4) Reserved

41-6.02 MATERIALS

41-6.02A General

Use fast-setting or polyester concrete to fill core holes.

41-6.03 CONSTRUCTION

41-6.03A Cracking

Crack existing concrete pavement using the procedures and equipment from the authorized test section.

Do not allow flying debris during cracking operations.

Crack existing concrete pavement into segments that nominally measure 6 feet transversely by 4 feet longitudinally. If the existing pavement is already cracked into segments, crack it into equal-sized square

or rectangular pieces that nominally measure not more than 6 feet transversely and from 3 to 5 feet longitudinally. Do not impact the pavement within 1 foot of another break line, pavement joint, or edge of pavement.

Cracks must be vertical, continuous, and penetrate the full depth of pavement. Cracks must be within 6 inches of vertical along the full depth of pavement. Do not cause surface spalling over 0.10-foot deep or excessive shattering of the pavement or base.

Cracking equipment must impact the pavement with a variable force in a controlled location. Do not use unguided free-falling weights such as "headache balls."

If the concrete pavement has no more than 0.10 foot of asphalt concrete on the surface, you may crack the pavement without removing the asphalt concrete. After cracking, construct an inspection strip by removing at least 500 square feet of asphalt concrete at a location determined by the Engineer. Construct additional inspection strips to demonstrate compliance where ordered by the Engineer.

After cracking, allow public traffic on the cracked or initial pavement layer for no more than 15 days.

41-6.03B Seating

Seat cracked concrete by making at least 5 passes over the cracked concrete with either:

1. Oscillating pneumatic-tired roller under section 39-3.03 and at least 15 tons
2. Vibratory pad-foot roller exerting a dynamic centrifugal force of at least 10 tons

A pass is 1 movement of a roller in either direction at 5 mph or less.

After all segments have been seated, clean loose debris from joints and cracks using compressed air free of moisture and oil.

Reseat any segment of cracked pavement that has not been overlaid within 24 hours of seating.

41-6.03C Surface Preparation

Before opening cracked and seated pavement to traffic or overlaying:

1. Fill joints, cracks, and spalls wider than 3/4 inch and deeper than 1 inch by applying tack coat and placing HMA under section 39-1.15, except use the no. 4 gradation instead of 3/8-inch.
2. Remove all loose debris and sweep the pavement.

41-6.03D Reserved

41-6.04 PAYMENT

Crack and seat existing concrete pavement is measured from the area of pavement cracked and seated. No deduction is made for existing cracked segments. The Department does not pay for HMA used to fill joints, cracks, and spalls.

41-7 TRANSITION TAPER

41-7.01 GENERAL

Section 41-7 includes specifications for constructing transition tapers in existing pavement.

41-7.02 MATERIALS

Not Used

41-7.03 CONSTRUCTION

Construct transition tapers by either grinding or removing and replacing the existing concrete. Do not allow flying debris during the construction of tapers.

Grinding must comply with section 42.

Replacement concrete must comply with section 41-9 except place concrete to the taper level shown and finish the surface with a coarse broom.

If the transition taper will be overlaid with HMA that is not placed before opening to traffic and there is a grade difference of more than 0.04 foot, construct a temporary taper by placing HMA that complies with section 39-1.15. Remove the temporary HMA taper before constructing the transition taper.

41-7.04 PAYMENT

Pavement transition tapers are measured using the dimensions shown. The Department does not pay for temporary HMA tapers.

41-8 DOWEL BAR RETROFIT

Reserved

41-9 INDIVIDUAL SLAB REPLACEMENT WITH RAPID STRENGTH CONCRETE

41-9.01 GENERAL

41-9.01A Summary

Section 41-9 includes specifications for removing existing concrete pavement and constructing individual slab replacement with rapid strength concrete (ISR—RSC).

41-9.01B Definitions

concrete raveling: Disintegration of the concrete surface layer from aggregate loss.

early age: Any age less than 10 times the time of final setting for concrete determined under ASTM C403/C403M.

full-depth crack: Crack that runs from one edge of the concrete slab to the opposite or adjacent side of the slab.

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 a concrete penetration resistance that is at least 4,000 psi under ASTM C403/C403M.

41-9.01C Submittals

41-9.01C(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.

At least 45 days before starting ISR—RSC work submit a sample of cement from each proposed lot and samples of proposed admixtures in the quantities ordered by the Engineer.

During ISR—RSC placement 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 C917 except testing age and water content may be modified to suit the particular material.

Except for modulus of rupture tests, submit QC test result forms within 48 hours of the paving shift. Submit modulus of rupture results within:

1. 15 minutes of opening age test completion
2. 24 hours of 3-day test completion

41-9.01C(2) Quality Control Plan

If the quantity of ISR—RSC is at least 300 cu yd, submit a QC plan at least 20 days before placing trial slabs. If the quantity of ISR—RSC is less than 300 cu yd, submit proposed forms for RSC inspection, sampling, and testing.

41-9.01C(3) Mix Design

At least 10 days before use in a trial slab, submit a 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 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:
    10.1. 1 hour before opening age
    10.2. Opening age
    10.3. 1 hour after opening age
    10.4. 1 day
    10.5. 3 days
    10.6. 7 days
    10.7. 28 days
11. Shrinkage test data
12. Any special instructions or conditions such as water temperature requirements

41-9.01C(4) Reserved

41-9.01D Quality Control and Assurance

41-9.01D(1) General

Designate a QC manager and assistant QC managers to administer the QC plan. The QC managers must hold current American Concrete Institute (ACI) certification as a Concrete Field Testing Technician-Grade I and a Concrete Laboratory Testing Technician-Grade II, except the assistant QC managers may hold Concrete Laboratory Testing Technician-Grade I instead of Grade II.

The QC manager responsible for the production period involved must review and sign the sampling, inspection, and test reports before submitting them. The QC manager must be present for:

1. Each stage of mix design
2. Trial slab construction
3. Production and construction of RSC
4. 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 RSC except those specified.

Testing laboratories and equipment must comply with the Department's Independent Assurance Program. At the time of the QC plan submittal, the Department evaluates the quality control samplers and testers.

41-9.01D(2) Just-in-time Training

Reserved

41-9.01D(3) Quality Control Plan

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, qualifications, and certifications of QC personnel, including:
    1.1. QC manager
    1.2. Assistant QC managers
    1.3. Samplers and testers
2. Outline of procedure for the production, transportation, placement, and finishing of RSC

3. Outline of procedure and forms for concrete QC, sampling, and testing to be performed during and after RSC construction, including testing frequencies for modulus of rupture
4. Contingency plan for identifying and correcting problems in production, transportation, placement, or finishing RSC including:
    - 4.1. Action limits
    - 4.2. Suspension limits that do not exceed specified material requirements
    - 4.3. Detailed corrective action if limits are exceeded
    - 4.4. Temporary pavement structure provisions, including:
        - 4.4.1. The quantity and location of standby material
        - 4.4.2. Determination of need
5. Location of your quality control testing laboratory and testing equipment during and after paving operations
6. List of the testing equipment to be used, including the date of last calibration
7. Production target values for material properties that impact concrete quality or strength including cleanness value and sand equivalent
8. Outline procedure for placing and testing trial slabs, including:
    - 8.1. Locations and times
    - 8.2. Production procedures
    - 8.3. Placing and finishing methods
    - 8.4. Sampling methods, sample curing, and sample transportation
    - 8.5. Testing and test result reporting
9. Name of source plant with approved Material Plant Quality Program (MPQP)
10. Procedures or methods for controlling pavement quality including:
    - 10.1. Materials quality
    - 10.2. Contraction and construction joints
    - 10.3. Protecting pavement before opening to traffic

41-9.01D(4) Prepaving Conference

Schedule a prepaving conference and provide a facility to meet with the Engineer.

Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. Project manager
3. QC manager
4. Workers and your subcontractor's workers, including:
    - 4.1. Foremen
    - 4.2. Concrete plant manager
    - 4.3. Concrete plant operator
    - 4.4. Concrete plant inspectors
    - 4.5. Personnel performing saw cutting and joint sealing
    - 4.6. Paving machine operators
    - 4.7. Inspectors
    - 4.8. Samplers
    - 4.9. Testers

The purpose of the prepaving conference 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

Do not start trial slabs or paving activities until the listed personnel have attended the prepaving conference.

41-9.01D(5) Trial Slabs

Before starting individual slab replacement work, complete 1 trial slab for each mix design.

Place trial slabs near the job site at a mutually-agreed location that is neither on the roadway nor within the project limits. Trial slabs must be 10 by 20 feet and at least 10 inches thick.

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

Fabricate and test beams under California Test 524 to determine the 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 of each other.

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 3-day testing under California Test 524 except place them into sand at a time that is from 5 to 10 times the time of final setting measured under ASTM C403/403M or 24 hours, whichever is earlier.

Trial slabs must have an opening age modulus of rupture of not less than 400 psi and a 3-day modulus of rupture of not less than 600 psi.

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

41-9.01D(6) Quality Control Testing

41-9.01D(6)(a) General

Provide continuous process control and quality control sampling and testing throughout RSC production and placement. Notify the Engineer at least 2 business days notice before any sampling and testing. Establish a testing facility at the job site or at an authorized location.

Sample under California Test 125.

During ISR—RSC placement, sample and fabricate beams for modulus of rupture testing within the first 30 cubic yards, at least once every 130 cu yd, and within the final truckload. Submit split samples and fabricate test beams for the Department’s testing unless the Engineer informs you otherwise.

Determine the modulus of rupture at opening age under California Test 524, except beam specimens may be fabricated using an internal vibrator under ASTM C 31. Cure beams under the same conditions as the pavement until 1 hour before testing. Test 3 beam specimens in the presence of the Engineer and average the results. A single test represents no more than that day's production or 130 cu yd, whichever is less.

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.

41-9.01D(6)(b) Rapid Strength Concrete

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 cubic yards 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 41-9.01D(6)(a)

[a]Test at the most frequent interval.
[b]Check 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 causes. Post a copy of each control chart at a location determined by the Engineer.

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

Develop linear control charts for:

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

Control charts must include:

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

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

For air content control charts, the action limit is ±1.0 percent and the suspension limit is ±1.5 percent of the specified values. If no value is specified, apply the air content value used in the 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 RSC.

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.

41-9.01D(6)(c) Reserved

41-9.01D(7) Acceptance Criteria

41-9.01D(7)(a) General

The final texture of ISR—RSC must pass visual inspection and have a coefficient of friction of at least 0.30 determined under California Test 342.

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.

41-9.01D(7)(b) Modulus of Rupture

ISR—RSC is accepted based on your testing for modulus of rupture at opening age and the Department's testing for modulus of rupture at 3 days.

ISR—RSC must have a modulus of rupture at opening age that is at least 400 psi and a modulus of rupture at 3 days that is at least 600 psi.

Calculate the test result as the average from testing 3 beams for each sample. The test result represents 1 paving shift or 130 cu yd, whichever is less.

41-9.01D(7)(c) Concrete Pavement Smoothness

The Department tests for concrete pavement smoothness using a 12-foot straightedge. Straightedge smoothness specifications do not apply to the pavement surface placed within 12 inches of existing concrete pavement except parallel to the centerline at the midpoint of a transverse construction joint.

The concrete pavement surface must not vary from the lower edge of a 12-foot straightedge by more than:

1. 0.01 feet when parallel to the centerline
2. 0.02 feet when perpendicular to the centerline extending from edge to edge of a traffic lane

41-9.01D(7)(d) Cracking and Raveling

The Engineer rejects an ISR—RSC slab under section 6-3.06 if within 1 year of contract acceptance there is either:

1. Partial or full-depth cracking
2. Concrete raveling consisting of either:
   - 2.1. Combined raveled areas more than 5 percent of each ISR—RSC slab area
   - 2.2. Any single raveled area of more than 4 sq ft

41-9.01D(8) Reserved

41-9.02 MATERIALS

41-9.02A General

Reserved

41-9.02B Rapid Strength Concrete

RSC for ISR—RSC must comply with section 90-3.

Use either the 1-1/2 inch maximum or the 1-inch maximum combined grading specified in section 90-1.02C(4)(d).

Air content must comply with the minimum requirements in section 40-1.02B(4).

41-9.02C Base Bond Breaker

Use base bond breaker no. 3, 4, or 5 under section 36-2.

41-9.02D Reserved

41-9.03 CONSTRUCTION

41-9.03A General

Complete ISR—RSC adjacent to new pavement or existing pavement shown for construction as a 1st order of work. Replace individual slabs damaged during construction before placing final pavement delineation.

41-9.03B Removing Existing Pavement

Remove pavement under section 15-2.02. The Engineer determines the exact ISR—RSC limits after overlying layers are removed.

After removing pavement to the depth shown, grade to a uniform plane. Water as needed and compact the material remaining in place to a firm and stable base. The finished surface of the remaining material must not extend above the grade established by the Engineer.

41-9.03C Drill and Bond Dowel Bars

Drill existing concrete and bond dowel bars under section 41-10 if described. Do not install dowel bars in contraction joints.

41-9.03D Base Bond Breaker

Place base bond breaker before placing ISR—RSC. Comply with section 36-2.

41-9.03E Placing Rapid Strength Concrete

Do not place RSC if the ambient air temperature is forecast by the National Weather Service to be less than 40 degrees F within 72 hours of final finishing.

Before placing 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 and extend the full depth of pavement to the top of the base layer. Place the top of the joint filler flush with the top of the pavement. Secure joint filler to the joint face of the existing pavement to prevent the joint filler from moving during the placement of RSC.

Use metal or wood side forms. Wood side forms must not be less than 1-1/2 inches thick. Side forms and connections must be of sufficient rigidity that movement will not occur under forces from equipment or RSC. Clean and oil side forms before each use. Side forms must remain in place until the pavement edge no longer requires the protection of forms.

After you place RSC, consolidate it using high-frequency internal vibrators adjacent to forms and across the full paving width. Place RSC as nearly as possible to its final position. Do not use vibrators for extensive shifting of concrete pavement.

Spread and shape RSC with powered finishing machines supplemented by hand finishing. After you mix and place RSC, do not add water to the surface to facilitate finishing. You may request authorization to use surface finishing additives. Submit the manufacturer's instructions with your request.

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.

Where the existing transverse joint spacing in an adjacent lane exceeds 15 feet, construct an additional transverse contraction joint midway between the existing joints. Complete sawing of contraction joints within 2 hours of completion of final finishing.

Cut contraction joints a minimum of 1/3 the slab depth.

41-9.03F Final Finishing

After preliminary finishing, round the edges of the initial paving width to a 0.04-foot radius. Round transverse and longitudinal construction joints to a 0.02-foot radius. Mark each ISR—RSC area with a stamp. The stamp mark must show the month, day, and year of placement and contract number. Level the location of the stamp with a steel trowel below the pavement texture. Orient the stamp mark so it can be read from the outside edge of ISR—RSC.

Before curing, texture the pavement. Perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with a steel-tined device that produces grooves parallel with the centerline.

Tines must be from 3/32 to 1/8 inch wide on 3/4-inch centers and have enough length, thickness, and resilience to form grooves from 1/8 to 3/16 inch deep after the concrete has hardened. Grooves must extend over the entire pavement width except do not construct grooves 3 inches from longitudinal pavement edges or joints.

Final texture must be uniform and smooth. Grooves must be parallel and aligned to the pavement edge across the pavement width. The groove alignment must not vary more than 0.1 foot for every 12 foot length.

Protect RSC under section 90-1.03C.

41-9.03G Temporary Pavement Structure

Temporary pavement structure must be RSC or 3-1/2 inch thick HMA over aggregate base.

41-9.03H Noncompliant Individual Slab Replacement

Replace an ISR—RSC slab with any of the following:

1. One or more full-depth cracks.
2. Concrete raveling.
3. Noncompliant smoothness except you may request authorization for grinding under section 42 and retesting. Grinding that causes a depression will not be considered. Smoothness must be corrected within 48 hours of placing ISR—RSC.
4. Noncompliant modulus of rupture.

If the modulus of rupture at opening age is at least 400 psi and the modulus of rupture at 3 days is at least 500 psi but less than 600 psi, you may request authorization to leave the ISR—RSC in place and accept the specified deduction.

If pavement is noncompliant for coefficient of friction, groove or grind the pavement under section 42. Comply with section 40-1.03Q(4) and groove or grind before the installation of any required joint seal or edge drains adjacent to the areas to the noncompliant area.

If an ISR—RSC slab has partial depth cracking, treat it with high-molecular-weight methacrylate under section 41-3.

41-9.03I Replace Pavement Delineation

Replace traffic stripes, pavement markings, and markers that are removed, obliterated, or damaged by ISR—RSC under sections 84 and 85.

41-9.03J Reserved

41-9.04 PAYMENT

Replace base is not included in the payment for individual slab replacement (RSC).

Drill and bond dowel bars are not included in payment for individual slab replacement (RSC).

For individual slab replacement (RSC) with a modulus of rupture at opening age that is at least 400 psi and a modulus of rupture at 3 days that is greater than or equal to 500 psi but less than 550 psi, the Department deducts 10 percent of the payment for individual slab replacement (RSC).

For individual slab replacement (RSC) with a modulus of rupture at opening age that is at least 400 psi and a modulus of rupture at 3 days that is greater than or equal to 550 psi but less than 600 psi, the Department deducts 5 percent of the payment for individual slab replacement (RSC).

41-10 DRILL AND BOND BARS

41-10.01 GENERAL

41-10.01A Summary

Section 41-10 includes specifications for drilling, installing, and bonding tie bars and dowel bars in concrete pavement.

41-10.01B Definitions

Reserved

41-10.01C Submittals

Submit a certificate of compliance for:

1. Tie bars
2. Dowel bars
3. Dowel bar lubricant
4. Chemical adhesive
5. Epoxy powder coating

At least 15 days before delivery to the job site, submit the manufacturer's recommendations and instructions for storage, handling, and use of chemical adhesive.

41-10.01D Quality Control and Assurance

41-10.01D(1) General

Drill and bond bar is accepted based on inspection before concrete placement.

41-10.01D(2) Reserved

41-10.02 MATERIALS

41-10.02A General

Dowel bar lubricant must comply with section 40-1.02D.

Chemical adhesive for drilling and bonding bars must be on the Authorized Material List. The Authorized Material List indicates the appropriate chemical adhesive system for concrete temperature and installation conditions.

Each chemical adhesive system container must clearly and permanently show the following:

1. Manufacturer's name
2. Model number of the system
3. Manufacture date
4. Batch number
5. Expiration date
6. Current International Conference of Building Officials Evaluation Report number
7. Directions for use
8. Storage requirement
9. Warnings or precautions required by state and federal laws and regulations

41-10.02B Reserved

41-10.03 CONSTRUCTION

41-10.03A General

Drill holes for bars. Clean drilled holes in compliance with the chemical adhesive manufacturer’s instructions. Holes must be dry at the time of placing the chemical adhesive and bars. Use a grout retention ring when drilling and bonding dowel bars. Immediately after inserting the bar into the chemical adhesive, support the bar to prevent movement until chemical adhesive has cured the minimum time recommended by the manufacturer.

Apply dowel bar lubricant to the entire exposed portion of the dowel bar.

If the Engineer rejects a bar installation: stop paving, drilling, and bonding activities. Adjust your procedures and obtain the Engineer's verbal authorization before resuming paving, drilling, and bonding.

Cut the rejected bar flush with the pavement joint surface and coat the exposed end of the bar with chemical adhesive. Offset the new hole 3 inches horizontally from the rejected hole's center.

41-10.03B Tie Bar Tolerance

Place tie bars within the tolerances shown in the following table:

Tie Bar Tolerances

Dimension	Tolerance
Horizontal skew (vertical skew: bar length)	1:6
Vertical skew (vertical skew: bar length)	1:6
Longitudinal translation (inch)	±1
Horizontal offset (embedment, inch)	±1
Height relative to the adjacent bar	±1
Vertical Depth (clearance from the pavement surface or bottom, inches, min)	3

41-10.03C Dowel Bar Tolerance

Place dowel bars within the tolerances specified in section 40-1.01D(7)(b)(v).

41-10.03D Reserved

41-10.04 PAYMENT

Not Used

41-11–41-15 RESERVED

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42 GROOVE AND GRIND CONCRETE

07-19-13

Replace the paragraph of section 42-1.01A with:

07-19-13

Section 42-1 includes general specifications for grooving and grinding concrete.

Replace the headings and paragraphs in section 42-3 with:

07-19-13

42-3.01 GENERAL

42-3.01A Summary

Section 42-3 includes specifications for grinding the surfaces of pavement, bridge decks, and approach slabs.

42-3.01B Definitions

Reserved

42-3.01C Submittals

Reserved

42-3.01D Quality Control and Assurance

Reserved

42-3.02 MATERIALS

Not Used

42-3.03 CONSTRUCTION

42-3.03A General

Grind surfaces in the longitudinal direction of the traveled way and grind the full lane width. Begin and end grinding at lines perpendicular to the roadway centerline.

Grinding must result in a parallel corduroy texture with grooves from 0.08 to 0.12 inch wide and from 55 to 60 grooves per foot of width. Grooves must be from 0.06 to 0.08 inch from the top of the ridge to the bottom of the groove.

Grind with abrasive grinding equipment using diamond cutting blades mounted on a self-propelled machine designed for grinding and texturing concrete pavements.

42-3.03B Pavement

Grind existing concrete pavement that is adjacent to an individual slab replacement. Grind the replaced individual slab and all the existing slabs immediately surrounding it. Grind after the individual slab is replaced.

Grind existing concrete pavement that is adjacent to new lanes of concrete pavement. Grind before paving.

After grinding, the existing pavement must comply with requirements for smoothness and coefficient of friction in section 40 except:

1. At the midpoint of a joint or crack, test smoothness with a straightedge. Both sides must have uniform texture.
2. Straightedge and inertial profiler requirements do not apply to areas abnormally depressed from subsidence or other localized causes. End smoothness testing 15 feet before and resume 15 feet after these areas.
3. Cross-slope must be uniform and have positive drainage across the traveled way and shoulder.

As an alternative to grinding existing concrete pavement, you may replace the existing pavement. The new concrete pavement must be the same thickness as the removed pavement. Replace existing pavement between longitudinal joints or pavement edges and transverse joints. Do not remove portions of slabs.

Replacement of existing concrete pavement must comply with requirements for individual slab replacement in section 41-9.

42-3.03C Bridge Decks, Approach Slabs, and Approach Pavement

Grind bridge decks, approach slabs, and approach pavement only if described.

The following ground areas must comply with the specifications for smoothness and concrete cover over reinforcing steel in section 51-1.01D(4):

1. Bridge decks
2. Approach slabs
3. Adjacent 50 feet of approach pavement

After grinding, the coefficient of friction must comply with section 51-1.01D(4).

42-3.04 PAYMENT

Grinding existing approach slabs and adjacent 50 feet of approach pavement is paid for as grind existing bridge deck.

The Department does not pay for grinding replacement concrete pavement or for additional grinding to comply with smoothness requirements.

Add to section 42:

07-19-13

42-4–42-9 RESERVED

^^^

section 90, except they must not contain chloride ions in excess of 0.25 percent by weight. Do not exceed 5 gallons of water per 94 lb of cement.

Mix the grout as follows:

1. Add water to the mixer followed by cement and any admixtures or fine aggregate.
2. Mix the grout with mechanical mixing equipment that produces a uniform and thoroughly mixed grout.
3. Agitate the grout continuously until the grout is pumped.
4. Do not add water after the initial mixing.

Add to section 46-1.03B:

04-20-12

Dispose of drill cuttings under section 19-2.03B.

Add to the end of section 46-1.03C:

07-19-13

Grouting equipment must be:

1. Capable of grouting at a pressure of at least 100 psi
2. Equipped with a pressure gage having a full-scale reading of not more than 300 psi

07-19-13

Delete the 3rd paragraph of section 46-2.01A.

Add to the beginning of section 46-2.01C:

07-19-13

Submittals for strand tendons, bar tendons, bar couplers, and anchorage assemblies must comply with section 50-1.01C.

Add to section 46-2.01D:

07-19-13

46-2.01D(3) Steel

Strand tendons, bar tendons, bar couplers, and anchorage assemblies must comply with section 50-1.01D.

46-2.01D(4) Grout

The Department tests the efflux time of the grout under California Test 541.

Add to the beginning of section 46-2.02B:

07-19-13

Strand tendons, bar tendons, and bar couplers must comply with section 50-1.02B.

Replace the 1st paragraph of section 46-2.02E with:

07-19-13

The efflux time of the grout immediately after mixing must be at least 11 seconds.

Add between the 13th and 14th paragraphs of section 46-2.03A:

07-19-13

If hot weather conditions will contribute to quick stiffening of the grout, cool the grout by authorized methods as necessary to prevent blockages during pumping activities.

Add between the 1st and 2nd paragraphs of section 46-2.03D:

07-19-13

Secure the ends of strand tendons with a permanent type anchorage system that:

1. Holds the prestressing steel at a force producing a stress of at least 95 percent of the specified ultimate tensile strength of the steel
2. Permanently secures the ends of the prestressing steel

Replace the 2nd sentence of the 1st paragraph of section 46-3.02A with:

07-19-13

The epoxy-coated prefabricated reinforcing bar must comply with section 52-2.03, except the epoxy thickness must be from 10 to 12 mils.

Replace the 2nd paragraph of section 46-3.02B with:

07-19-13

Concrete anchors on bearing plates must comply with the specifications for studs in clause 7 of AWS D1.1.

07-19-13

Delete the 1st paragraph of section 46-3.02E.

^^

47 EARTH RETAINING SYSTEMS

07-19-13

Replace the 2nd paragraph of section 47-2.01D with:

02-17-12

Coupler test samples must comply with minimum tensile specifications for steel wire in ASTM A 82/A 82M. Total wire slip must be at most 3/16 inch when tested under the specifications for tension testing of round wire test samples in ASTM A 370.

Replace "78-80" in the 1st table in the 2nd paragraph of section 47-2.02C with:

10-19-12

78-100

Replace the value for the sand equivalent requirement in the 2nd table in the 3rd paragraph of section 47-2.02C with:

01-20-12

12 minimum

Replace the 1st paragraph of section 47-2.02E with:

02-17-12

Steel wire must comply with ASTM A 82/A 82M. Welded wire reinforcement must comply with ASTM A 185/A 185M.

Replace section 47-3 with:

07-19-13

47-3 REINFORCED CONCRETE CRIB WALLS

47-3.01 General

Section 47-3 includes specifications for constructing reinforced concrete crib walls.

Reinforced concrete crib walls must comply with section 51.

Reinforcement must comply with section 52.

Concrete crib walls consist of a series of rectangular cells composed of interlocking, precast, reinforced concrete headers, stretchers, and blocks.

47-3.02 Materials

47-3.02A General

Pads shown to be placed between bearing surfaces must either be (1) neoprene complying with the specifications for strip waterstops in section 51-2.05 or (2) commercial quality no. 30 asphalt felt. The protective board is not required for neoprene pads.

47-3.02B Crib Members

47-3.02B(1) General

All members may be manufactured to dimensions 1/8 inch greater in thickness than shown. The thickness of the lowest step must not be less than the dimension shown.

Stretchers may be manufactured 1/2 inch less in length than shown.

When an opening is shown in the face of the wall, special length stretchers and additional headers may be necessary.

For non-tangent wall alignments, special length stretchers may be required.

For non-tangent wall alignments and at locations where filler blocks are required, special length front face closure members may be required.

47-3.02B(2) Reinforcement

Reinforcing wire must comply with ASTM A 496/A 496M.

For hoops or stirrups use either (1) reinforcing wire or (2) deformed steel welded wire reinforcement. The size must be equivalent to the reinforcing steel shown. Deformed steel welded wire reinforcement must comply with ASTM A 497/A 497M.

47-3.02B(3) Concrete

Concrete test cylinders must comply with section 90-1.01D(5), except when the penetration of fresh concrete is less than 1 inch, the concrete in the test mold must be consolidated by vibrating the mold equivalent to the consolidating effort being used to consolidate the concrete in the members.

Cure crib members under section 51-4.02C.

When removed from forms, the members must present a true surface of even texture, free from honeycombs and voids larger than 1 inch in diameter and 5/16 inch in depth. Clean and fill other pockets with mortar under sections 51-1.02F and 51-1.03E(2).

External vibration resulting in adequate consolidation may be used.

If the Engineer determines that rock pockets are of the extent or character as to affect the strength of the member or to endanger the life of the steel reinforcement, replace the member.

Finish concrete-to-concrete bearing surfaces to a smooth plane. Section 51-1.03F does not apply to concrete crib members.

47-3.03 Construction

Place reinforced concrete crib walls to the lines and grades established by the Engineer. The foundation must be accepted by the Engineer before any crib members are placed.

The gap between bearing surfaces must not exceed 1/8 inch.

Where a gap of 1/16 inch to 1/8 inch exists or where shown, place a 1/16-inch pad of asphalt felt or sheet neoprene between the bearing surfaces.

47-3.04 Payment

The area of reinforced concrete crib wall is measured on the batter at the outer face for the height from the bottom of the bottom stretcher to the top of the top stretcher and for a length measured from end to end of each section of wall.

Add between the 3rd and 4th paragraphs of section 47-5.01:

10-19-12

Reinforcement must comply with section 52.

Add to section 47-6.01A:

10-19-12

The alternative earth retaining system must comply with the specifications for the type of wall being constructed.

Replace "sets" at each occurrence in the 1st paragraph of section 47-6.01C with:

04-19-13

copies

^^

48 TEMPORARY STRUCTURES

07-19-13

Replace "previously welded splice" and its definition in section 48-2.01B with:

04-19-13

previously welded splice: Splice made in a falsework member in compliance with AWS D1.1 or other recognized welding standard before contract award.

Add to section 48-2.01B:

07-19-13

independent support system: Support system that is in addition to the falsework removal system employing methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS rods, or cranes.

04-19-13

Delete "field" in the 1st sentence of the 5th paragraph of section 48-2.01C(1).

Replace item 1 in the list in the 6th paragraph of section 48-2.01C(1) with:

04-19-13

1. Itemize the testing, inspection methods, and acceptance criteria used

Replace "sets" at each occurrence in the 4th paragraph of section 48-2.01C(2) with:

07-19-13

copies

Replace the 7th paragraph of section 48-2.01C(2) with:

09-16-11

If you submit multiple submittals at the same time or additional submittals before review of a previous submittal is complete:

1. You must designate a review sequence for submittals
2. Review time for any submittal is the review time specified plus 15 days for each submittal of higher priority still under review

Add to section 48-2.01C(2):

07-19-13

Shop drawings and calculations for falsework removal systems employing methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS rods, or cranes must include:

1. Design code used for the analysis of the structural members of the independent support system
2. Provisions for complying with current Cal/OSHA requirements
3. Load tests and ratings within 1 year of intended use of hydraulic jacks and winches
4. Location of the winches, hydraulic jacks with prestressing steel, HS rods, or cranes
5. Analysis showing that the bridge deck and overhang are capable of supporting all loads at all time
6. Analysis showing that winches will not overturn or slide during all stages of loading
7. Location of deck and soffit openings if needed
8. Details of repair for the deck and soffit openings after falsework removal

Replace the 1st paragraph of section 48-2.01D(2) with:

04-19-13

Welding must comply with AWS D1.1 or other recognized welding standard, except for fillet welds where the load demands are 1,000 lb or less per inch for each 1/8 inch of fillet weld.

Replace the 1st through 3rd sentences in the 2nd paragraph of section 48-2.01D(2) with:

04-19-13

Perform NDT on welded splices using UT or RT. Each weld and any repair made to a previously welded splice must be tested.

Replace the 3rd paragraph of section 48-2.01D(2) with:

04-19-13

For previously welded splices, perform and document all necessary testing and inspection required to certify the ability of the falsework members to sustain the design stresses.

Add to section 48-2.01D(3)(a):

07-19-13

Falsework removal system employing methods of holding falsework from above and members of the independent support system must support the sum of the actual vertical and horizontal loads due to falsework materials, equipment, construction sequence or other causes, and wind loading. Identifiable mechanical devices used in the falsework removal plan must meet applicable industry standards and manufacturer instructions for safe load carrying capacity. Unidentifiable winches must be capable of carrying twice the design load.

The load used for the analysis of overturning moment and sliding of the winch system must be 150 percent of the design load.

Add to section 48-2.03D:

07-19-13

Falsework removal employing methods of holding falsework by winches, hydraulic jacks with prestressing steel, HS rods, or cranes must also be supported by an independent support system when the system is not actively lowering the falsework at vehicular, pedestrian, or railroad traffic openings.

Bridge deck openings used to facilitate falsework removal activities must be formed and located away from the wheel path. The formed openings must be wedge shaped with a 5-inch maximum diameter at the top and a 3-inch maximum diameter at the bottom.

Anchor 10-inch-square aluminum or galvanized steel wire, 1/4-inch-mesh hardware cloth with a 0.025-inch minimum wire diameter firmly to the inside of the soffit openings. Construct a 1/2-inch drip groove to the outside of soffit openings.

Clean and roughen openings made in the bridge deck. Fill the deck openings with rapid setting concrete complying with section 15-5.02.

^^

49 PILING

07-19-13

Replace "sets" in the 1st paragraph of section 49-1.01C(2) with:

04-19-13

copies

Replace "set" in the 2nd paragraph of section 49-1.01C(2) with:

04-19-13

copy

Replace "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" in the 5th paragraph of section 49-1.01D(2) with:

07-20-12

"Tensile Load Applied by Hydraulic Jack(s) Acting Upward at One End of Test Beam(s)"

Add to section 49-1.03:

04-20-12

Dispose of drill cuttings under section 19-2.03B.

Replace the paragraph of section 49-2.01A(1) with:

07-19-13

Section 49-2.01 includes general specifications for fabricating and installing driven piles.

Epoxy-coated bar reinforcing steel used for pile anchors must comply with section 52-2.02.

Replace the 2nd paragraph of section 49-2.01D with:

01-20-12

Furnish piling is measured along the longest side of the pile from the specified tip elevation shown to the plane of pile cutoff.

Replace the paragraph of section 49-2.02A(1) with:

07-19-13

Section 49-2.02 includes specifications for fabricating and installing steel pipe piles.

Replace the definitions in section 49-2.02A(2) with:

07-19-13

shop welding: Welding performed at a plant on the Department's Authorized Facility Audit List.

field welding: Welding not performed at a plant on the Department's Authorized Facility Audit List.

Replace item 2 in the list in the paragraph of section 49-2.02A(3)(b) with:

07-19-13

2. Certified mill test reports for each heat number of steel used in pipe piles being furnished.

Replace the paragraph of section 49-2.02A(4)(a) with:

07-19-13

Section 11-3.02 does not apply to shop welds in steel pipe piles fabricated at a facility on the Department's Authorized Facility Audit List.

For groove welds using submerged arc welding from both sides without backgouging, qualify the WPS under Table 4.5 of AWS D1.1.

Replace "0.45" in the 2nd paragraph of section 49-2.02B(1)(a) with:

07-19-13

0.47

Replace the 1st paragraph of section 49-2.02B(1)(b) with:

07-19-13

Welds must comply with AWS D1.1. Circumferential welds must be CJP welds.

07-19-13

Delete the 5th paragraph of section 49-2.02B(1)(b).

Add to section 49-2.02B(1):

07-19-13

49-2.02B(1)(d) Reserved

Replace "4.8.4" in item 2.3 in the list in the 2nd paragraph of section 49-2.02B(2) with:

07-19-13

4.9.4

07-19-13

Delete the 3rd paragraph of section 49-2.02C(2).

Replace the paragraph of section 49-2.03A(1) with:

07-19-13

Section 49-2.03 includes specifications for fabricating and installing structural shape steel piles.

Replace the paragraph of section 49-2.03A(3) with:

07-19-13

Submit a certified material test report and a certificate of compliance that includes a statement that all materials and workmanship incorporated in the work and all required tests and inspections of this work have been performed as described.

Replace the 1st paragraph of section 49-2.03B with:

07-19-13

Structural shape steel piles must comply with ASTM A 36/A 36M, ASTM A 572/A 572M, ASTM A 709/A 709M, or ASTM A 992/A 992M.

Replace "sets" in the 1st paragraph of section 49-2.04A(3) with:

04-19-13

copies

07-19-13

Delete the 1st paragraph of section 49-2.04A(4).

Replace the 3rd and 4th paragraphs of section 49-2.04B(2) with:

10-19-12

Piles in a corrosive environment must be steam or water cured under section 90-4.03.

If piles in a corrosive environment are steam cured, either:

1. Keep the piles continuously wet for at least 3 days. The 3 days includes the holding and steam curing periods.
2. Apply curing compound under section 90-1.03B(3) after steam curing.

Replace the 1st paragraph of section 49-3.01A with:

07-19-13

Section 49-3.01 includes general specifications for constructing CIP concrete piles.

Add to section 49-3.01A:

01-20-12

Concrete must comply with section 51.

Replace the 1st paragraph of section 49-3.01C with:

01-20-12

Except for CIDH concrete piles constructed under slurry, construct CIP concrete piles such that the excavation methods and the concrete placement procedures provide for placing the concrete against undisturbed material in a dry or dewatered hole.

Replace "Reserved" in section 49-3.02A(2) with:

01-20-12

dry hole:

1. Except for CIDH concrete piles specified as end bearing, a drilled hole that:
   1.1. Accumulates no more than 12 inches of water in the bottom of the drilled hole during a period of 1 hour without any pumping from the hole during the hour.
   1.2. Has no more than 3 inches of water in the bottom of the drilled hole immediately before placing concrete.
2. For CIDH concrete piles specified as end bearing, a drilled hole free of water without the use of pumps.

Replace "Reserved" in section 49-3.02A(3)(a) with:

01-20-12

If plastic spacers are proposed for use, submit the manufacturer's data and a sample of the plastic spacer. Allow 10 days for review.

Replace item 5 in the list in the 1st paragraph of section 49-3.02A(3)(b) with:

10-19-12

5. Methods and equipment for determining:
   5.1. Depth of concrete
   5.2. Theoretical volume of concrete to be placed, including the effects on volume if casings are withdrawn
   5.3. Actual volume of concrete placed

Add to the list in the 1st paragraph of section 49-3.02A(3)(b):

01-18-13

8. Drilling sequence and concrete placement plan.

Replace item 2 in the list in the 1st paragraph of section 49-3.02A(3)(g) with:

01-20-12

2. Be sealed and signed by an engineer who is registered as a civil engineer in the State. This requirement is waived for either of the following conditions:
   2.1. The proposed mitigation will be performed under the current Department-published version of *ADSC Standard Mitigation Plan 'A' - Basic Repair* without exception or modification.
   2.2. The Engineer determines that the rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, and you elect to repair the pile using the current

Department-published version of *ADSC Standard Mitigation Plan 'B' - Grouting Repair* without exception or modification.

Replace "49-2.03A(4)(d)" in the 1st paragraph of section 49-3.02A(4)(d)(i) with:

07-19-13

49-3.02A(4)(d)

Add to the beginning of section 49-3.02A(4)(d)(ii):

07-19-13

If the drilled hole is dry or dewatered without the use of temporary casing to control ground water, installation of inspection pipes is not required.

Replace item 1 in the list in the 1st paragraph of section 49-3.02A(4)(d)(ii) with:

01-20-12

1. Inspection pipes must be schedule 40 PVC pipe complying with ASTM D 1785 with a nominal pipe size of 2 inches. Watertight PVC couplers complying with ASTM D 2466 are allowed to facilitate pipe lengths in excess of those commercially available. Log the location of the inspection pipe couplers with respect to the plane of pile cutoff.

Add to section 49-3.02A(4)(d)(iv):

01-20-12

If the Engineer determines it is not feasible to use one of ADSC's standard mitigation plans to mitigate the pile, schedule a meeting and meet with the Engineer before submitting a nonstandard mitigation plan.

The meeting attendees must include your representatives and the Engineer's representatives involved in the pile mitigation. The purpose of the meeting is to discuss the type of pile mitigation acceptable to the Department.

Provide the meeting facility. The Engineer conducts the meeting.

Replace the 1st paragraph of section 49-3.02B(5) with:

07-19-13

Grout must consist of cementitious material and water, and may contain an admixture if authorized. Do not exceed 5 gallons of water per 94 lb of cement.

Cementitious material must comply with section 90-1.02B, except SCMs are not required.

Water must comply with section 90-1.02D. If municipally supplied potable water is used, the testing specified in section 90-1.02D is waived.

Admixtures must comply with section 90, except admixtures must not contain chloride ions in excess of 0.25 percent by weight.

Use aggregate to extend the grout as follows:

1. Aggregate must consist of at least 70 percent fine aggregate and approximately 30 percent pea gravel, by weight.
2. Fine aggregate must comply with section 90-1.02C(3).
3. Size of pea gravel must be such that 100 percent passes the 1/2-inch sieve, at least 85 percent passes the 3/8-inch sieve, and not more than 5 percent passes the no. 8 sieve.
4. Minimum cementitious material content of the grout must not be less than 845 lb/cu yd of grout.

Mix the grout as follows:

1. Add water to the mixer followed by cementitious material, aggregates, and any admixtures.
2. Mix the grout with mechanical mixing equipment that produces a uniform and thoroughly mixed grout.
3. Agitate the grout continuously until the grout is pumped.
4. Do not add water after initial mixing.

Replace section 49-3.02B(8) with:

01-20-12

49-3.02B(8) Spacers

Spacers must comply with section 52-1.03D, except you may use plastic spacers.

Plastic spacers must:

1. Comply with sections 3.4 and 3.5 of the Concrete Reinforcing Steel Institute's *Manual of Standard Practice*
2. Have at least 25 percent of their gross plane area perforated to compensate for the difference in the coefficient of thermal expansion between the plastic and concrete
3. Be of commercial quality

Add between the 1st and 2nd paragraphs of section 49-3.02C(2):

07-19-13

For CIDH concrete piles with a pile cap, the horizontal tolerance at the center of each pile at pile cut-off is the larger of 1/24 of the pile diameter or 3 inches. The horizontal tolerance for the center-to-center spacing of 2 adjacent piles is the larger of 1/24 of the pile diameter or 3 inches.

Add to section 49-3.02C(4):

01-20-12

Unless otherwise shown, the bar reinforcing steel cage must have at least 3 inches of clear cover measured from the outside of the cage to the sides of the hole or casing.

Place spacers at least 5 inches clear from any inspection tubes.

Place plastic spacers around the circumference of the cage and at intervals along the length of the cage, as recommended by the manufacturer.

07-19-13

For a single CIDH concrete pile supporting a column:

1. If the pile and the column share the same reinforcing cage diameter, this cage must be accurately placed as shown
2. If the pile reinforcing cage is larger than the column cage and the concrete is placed under dry conditions, maintain a clear horizontal distance of at least 3.5 inches between the two cages
3. If the pile reinforcing cage is larger than the column cage and the concrete is placed under slurry, maintain a clear horizontal distance of at least 5 inches between the two cages

Replace section 49-3.02C(6) with:

07-19-13

49-3.02C(6) Construction Joint

Section 49-3.02C(6) applies to CIDH concrete piles where a construction joint is shown.

If a permanent steel casing is not shown, you must furnish and install a permanent casing. The permanent casing must:

1. Be watertight and of sufficient strength to prevent damage and to withstand the loads from installation procedures, drilling and tooling equipment, lateral concrete pressures, and earth pressures.
2. Extend at least 5 feet below the construction joint. If placing casing into rock, the casing must extend at least 2 feet below the construction joint.
3. Not extend above the top of the drilled hole or final grade whichever is lower.
4. Not increase the diameter of the CIDH concrete pile more than 2 feet.
5. Be installed by impact or vibratory hammers, oscillators, rotators, or by placing in a drilled hole. Casings placed in a drilled hole must comply with section 49-3.02C(5).

Section 49-2.01A(4)(b) does not apply to permanent casings specified in this section.

Add to section 49-4.01:

07-19-13

Steel soldier piles must comply with section 49-2.03.

Replace the headings and paragraphs in section 49-4.02 with:

07-19-13

Concrete anchors must comply with the specifications for studs in clause 7 of AWS D1.1.

^^

50 PRESTRESSING CONCRETE

07-19-13

Replace "sets" at each occurrence in the 2nd and 3rd paragraphs of section 50-1.01C(3) with:

04-19-13

copies

Add to section 50-1.01C(3):

07-19-13

Include a grouting plan with your shop drawing submittal. The grouting plan must include:

1. Detailed grouting procedures
2. Type, quantity, and brand of materials to be used
3. Type of equipment to be used including provisions for backup equipment
4. Types and locations of grout inlets, outlets, and vents
5. Methods to clean ducts before grouting
6. Methods to control the rate of flow within ducts
7. Theoretical grout volume calculations for each duct
8. Duct repair procedures due to an air pressure test failure
9. Mixing and pumping procedures
10. Direction of grouting
11. Sequence of use of inlets and outlets
12. Procedure for handling blockages
13. Proposed forms for recording grouting information
14. Procedure for secondary grouting
15. Names of people who will perform grouting activities including their relevant experience and certifications

Add to section 50-1.01C:

07-19-13

50-1.01C(5) Grout

Submit a daily grouting report for each day grouting is performed. Submit the report within 3 days after grouting. The report must be signed by the technician supervising the grouting activity. The report must include:

1. Identification of each tendon
2. Date grouting occurred
3. Time the grouting started and ended
4. Date of placing the prestressing steel in the ducts
5. Date of stressing
6. Type of grout used
7. Injection end and applied grouting pressure
8. Actual and theoretical quantity of grout used to fill duct
9. Ratio of actual to theoretical grout quantity
10. Records of air, grout, and structure surface temperatures during grouting.
11. Summary of tests performed and results, except submit compressive strength and chloride ion test results within 48 hours of test completion
12. Names of personnel performing the grouting activity
13. Summary of problems encountered and corrective actions taken
14. Summary of void investigations and repairs made

Replace the introductory clause in the 1st paragraph of section 50-1.01C(4) with:

07-19-13

Submit test samples for the materials shown in the following table to be used in the work:

Add between "the" and "test samples" in the 1st paragraph of section 50-1.01D(2):

07-19-13

prestressing steel

Replace the 3rd paragraph of section 50-1.01D(2) with:

10-19-12

The Department may verify the prestressing force using the Department's load cells.

Replace the 3rd paragraph in section 50-1.01D(3) with:

07-19-13

Each pressure gage must be fully functional and have an accurately reading, clearly visible dial or display. The dial must be at least 6 inches in diameter and graduated in 100 psi increments or less.

Add between the 5th and 6th paragraphs of section 50-1.01D(3):

07-19-13

Each jack and its gages must be calibrated as a unit.

Replace the 6th paragraph in section 50-1.01D(3) with:

07-19-13

Each jack used to tension prestressing steel permanently anchored at 25 percent or more of its specified minimum ultimate tensile strength must be calibrated by METS within 1 year of use and after each repair. You must:

1. Schedule the calibration of the jacking equipment with METS
2. Mechanically calibrate the gages with a dead weight tester or other authorized means before calibration of the jacking equipment by METS
3. Verify that the jack and supporting systems are complete, with proper components, and are in good operating condition
4. Provide labor, equipment, and material to (1) install and support the jacking and calibration equipment and (2) remove the equipment after the calibration is complete
5. Plot the calibration results

Each jack used to tension prestressing steel permanently anchored at less than 25 percent of its specified minimum ultimate tensile strength must be calibrated by an authorized laboratory within 6 months of use and after each repair.

Add to section 50-1.01D:

07-19-13

50-1.01D(4) Pressure Testing Ducts

For post-tensioned concrete bridges, pressure test each duct with compressed air after stressing. To pressure test the ducts:

1. Seal all inlets, outlets, and grout caps.
2. Open all inlets and outlets on adjacent ducts.
3. Attach an air compressor to an inlet at 1 end of the duct. The attachment must include a valve that separates the duct from the air source.
4. Attach a pressure gage to the inlet at the end of the duct.
5. Pressurize the duct to 50 psi.
6. Lock-off the air source.
7. Record the pressure loss after 1 minute.
8. If there is a pressure loss exceeding 25 psi, repair the leaks with authorized methods and retest.

Compressed air used to clear and test the ducts must be clean, dry, and free of oil or contaminants.

50-1.01D(5) Duct Demonstration of Post-Tensioned Members

Before placing forms for deck slabs of box girder bridges, demonstrate that any prestressing steel placed in the ducts is free and unbonded. If no prestressing steel is in the ducts, demonstrate that the ducts are unobstructed.

If prestressing steel is installed after the concrete is placed, demonstrate that the ducts are free of water and debris immediately before installing the steel.

Before post-tensioning any member, demonstrate that the prestressing steel is free and unbonded in the duct.

The Engineer must witness all demonstrations.

50-1.01D(6) Void Investigation

In the presence of the Engineer, investigate the ducts for voids between 24 hours and 72 hours after grouting completion. As a minimum, inspect the inlet and outlet ports at the anchorages and at high points in the tendons for voids after removal. Completely fill any voids found with secondary grout.

50-1.01D(7) Personnel Qualifications

Perform post-tensioning field activities, including grouting, under the direct supervision of a technician certified as a level 2 Bonded PT Field Specialist through the Post-Tensioning Institute. Grouting activities may be performed under the direct supervision of a technician certified as a Grouting Technician through the American Segmental Bridge Institute.

Replace the 6th paragraph of section 50-1.02B with:

07-19-13

Package the prestressing steel in containers or shipping forms that protect the steel against physical damage and corrosion during shipping and storage.

Replace the 13th paragraph of section 50-1.02B with:

07-19-13

Prestressing steel is rejected if surface rust either:

1. Cannot be removed by hand-cleaning with a fine steel wool pad
2. Leaves pits visible to the unaided eye after cleaning

Replace the 4th paragraph of section 50-1.02C with:

07-19-13

Admixtures must comply with section 90, except admixtures must not contain chloride ions in excess of 0.25 percent by weight.

07-19-13

Delete the 5th paragraphs of section 50-1.02C.

Add to section 50-1.02C:

07-19-13

Secondary grout must:

1. Comply with ASTM C 1107
2. Not have a deleterious effect on the steel, concrete, or bond strength of the steel to concrete

Replace item 9 including items 9.1 and 9.2 in the list in the 1st paragraph of section 50-1.02D with:

07-19-13

9. Have an inside cross-sectional area of at least 2.5 times the net area of the prestressing steel for multistrand tendons

Replace "3/8" in item 10 in the list in the 1st paragraph of section 50-1.02D with:

07-19-13

1/2

07-19-13

Delete the 2nd sentences in the 1st paragraph of section 50-1.02E.

Replace section 50-1.02F with:

07-19-13

50-1.02F Permanent Grout Caps

Permanent grout caps for anchorage systems of post-tensioned tendons must:

1. Be glass-fiber-reinforced plastic with antioxidant additives. The environmental stress-cracking failure time must be at least 192 hours under ASTM D 1693, Condition C.

2. Completely cover and seal the wedge plate or anchorage head and all exposed metal parts of the anchorage against the bearing plate using neoprene O-ring seals.
3. Have a grout vent at the top of the cap.
4. Be bolted to the anchorage with stainless steel complying with ASTM F 593, alloy 316. All fasteners, including nuts and washers, must be alloy 316.
5. Be pressure rated at or above 150 psi.

Add to section 50-1.02:

09-16-11

50-1.02G Sheathing

Sheathing for debonding prestressing strand must:

1. Be split or un-split flexible polymer plastic tubing
2. Have a minimum wall thickness of 0.025 inch
3. Have an inside diameter exceeding the maximum outside diameter of the strand by 0.025 to 0.14 inch

Split sheathing must overlap at least 3/8 inch.

Waterproofing tape used to seal the ends of the sheathing must be flexible adhesive tape.

The sheathing and waterproof tape must not react with the concrete, coating, or steel.

Replace the 2nd paragraph of section 50-1.03A(3) with:

07-19-13

After installation, cover the duct ends and vents to prevent water or debris from entering.

Add to section 50-1.03A(3):

07-19-13

Support ducts vertically and horizontally during concrete placement at a spacing of at most 4 feet.

07-19-13

Delete "at least" in the 1st paragraph of section 50-1.03B(1).

Add to section 50-1.03B(1):

01-20-12

After seating, the maximum tensile stress in the prestressing steel must not exceed 75 percent of the minimum ultimate tensile strength shown.

07-19-13

Delete the 1st through 4th paragraphs of section 50-1.03B(2)(a).

Replace "temporary tensile strength" in the 7th paragraph of section 50-1.03B(2)(a) with:

07-19-13

temporary tensile stress

Add to section 50-1.03B(2)(a):

07-19-13

If prestressing strand is installed using the push-through method, use guide caps at the front end of each strand to protect the duct from damage.

Add to the list in the 2nd paragraph of section 50-1.03B(2)(c):

07-19-13

3. Be equipped with permanent grout caps

Replace section 50-1.03B(2)(d) with:

07-19-13

50-1.03B(2)(d) Bonding and Grouting

50-1.03B(2)(d)(i) General

Bond the post-tensioned prestressing steel to the concrete by completely filling the entire void space between the duct and the prestressing steel with grout.

Ducts, vents, and grout caps must be clean and free from water and deleterious materials that would impair bonding of the grout or interfere with grouting procedures. Compressed air used for cleaning must be clean, dry, and free of oil or contaminants.

Prevent the leakage of grout through the anchorage assembly by positive mechanical means.

Before starting daily grouting activities, drain the pump system to remove any water from the piping system.

Break down and thoroughly clean the pump and piping system after each grouting session.

After completing duct grouting activities:

1. Abrasive blast clean and expose the aggregate of concrete surfaces where concrete is to be placed to cover and encase the anchorage assemblies
2. Remove the ends of vents 1 inch below the roadway surface

50-1.03B(2)(d)(ii) Mixing and Proportioning

Proportion solids by weight to an accuracy of 2 percent.

Proportion liquids by weight or volume to an accuracy of 1 percent.

Mix the grout as follows:

1. Add water to the mixer followed by the other ingredients.
2. Mix the grout with mechanical mixing equipment that produces a uniform and thoroughly mixed grout without an excessive temperature increase or loss of properties of the mixture.
3. Do not exceed 5 gal of water per 94 lb of cement or the quantity of water in the manufacturer's instructions, whichever is less.
4. Agitate the grout continuously until the grout is pumped. Do not add water after the initial mixing.

50-1.03B(2)(d)(iii) Placing

Pump grout into the duct within 30 minutes of the 1st addition of the mix components.

Inject grout from the lowest point of the duct in an uphill direction in 1 continuous operation maintaining a one-way flow of the grout. You may inject from the lowest anchorage if complete filling is ensured.

Before injecting grout, open all vents.

Continuously discharge grout from the vent to be closed. Do not close any vent until free water, visible slugs of grout, and entrapped air have been ejected and the consistency of the grout flowing from the vent is equivalent to the injected grout.

Pump the grout at a rate of 16 to 50 feet of duct per minute.

Conduct grouting at a pressure range of 10 to 50 psi measured at the grout inlet. Do not exceed maximum pumping pressure of 150 psi at the grout inlet.

As grout is injected, close the vents in sequence in the direction of flow starting with the closest vent.

Before closing the final vent at the grout cap, discharge at least 2 gal of grout into a clean receptacle.

Bleed all high point vents.

Lock a pressure of 5 psi into the duct by closing the grout inlet valve.

50-1.03B(2)(d)(iv) Weather Conditions

If hot weather conditions will contribute to quick stiffening of the grout, cool the grout by authorized methods as necessary to prevent blockages during pumping activities.

If freezing weather conditions are anticipated during and following the placement of grout, provide adequate means to protect the grout in the ducts from damage by freezing.

50-1.03B(2)(d)(v) Curing

During grouting and for a period of 24 hours after grouting, eliminate vibration from contractor controlled sources within 100 feet of the span in which grouting is taking place, including from moving vehicles, jackhammers, large compressors or generators, pile driving activities, soil compaction, and falsework removal. Do not vary loads on the span.

For PC concrete members, do not move or disturb the members after grouting for 24 hours. If ambient temperature drops below 50 degrees F, do not move or disturb the members for 48 hours.

Do not remove or open valves until grout has cured for at least 24 hours.

50-1.03B(2)(d)(vi) Grouting Equipment

Grouting equipment must be:

1. Capable of grouting at a pressure of at least 100 psi
2. Equipped with a pressure gage having a full-scale reading of not more than 300 psi
3. Able to continuously grout the longest tendon on the project in less than 20 minutes

Grout must pass through a screen with clear openings of 1/16 inch or less before entering the pump.

Fit grout injection pipes, ejection pipes, and vents with positive mechanical shutoff valves capable of withstanding the pumping pressures. Do not remove or open valves until the grout has set. If authorized, you may substitute mechanical valves with suitable alternatives after demonstrating their effectiveness.

Provide a standby grout mixer and pump.

50-1.03B(2)(d)(vii) Grout Storage

Store grout in a dry environment.

50-1.03B(2)(d)(viii) Blockages

If the grouting pressure reaches 150 psi, close the inlet and pump the grout at the next vent that has just been or is ready to be closed as long as a one-way flow is maintained. Do not pump grout into a succeeding outlet from which grout has not yet flowed.

When complete grouting of the tendon cannot be achieved by the steps specified, stop the grouting operation.

50-1.03B(2)(d)(ix) Secondary Grouting

Perform secondary grouting by vacuum grouting under the direct supervision of a person who has been trained and has experience in the use of vacuum grouting equipment and procedures.

The vacuum grouting process must be able to determine the size of the void and measure the volume of grout filling the void.

Vacuum grouting equipment must consist of:

1. Volumeter for the measurement of void volume
2. Vacuum pump with capacity of at least 10 cfm and equipped with a flow meter capable of measuring the amount of grout being injected

50-1.03B(2)(d)(x) Vertical Tendon Grouting

Provide a standpipe at the upper end of the tendon to collect bleed water and allow it to be removed from the grout. The standpipe must be large enough to prevent the grout elevation from dropping below the highest point of the upper anchorage device. If the grout level drops to the highest point of the upper anchorage device, immediately add grout to the standpipe.

Remove the standpipe after the grout has hardened.

For vertical tendons in excess of 100 feet high or if grouting pressure exceeds 145 psi, inject grout at a higher vent from which grout has already flowed to maintain one-way flow.

50-1.03B(2)(d)(xi) Vents

Place vents at the following locations:

1. Anchorage areas at both ends of the tendon
2. Each high point
3. 4 feet upstream and downstream of each crest of a high point
4. Each change in the cross section of duct

Add to section 50-1.03B(2):

09-16-11

50-1.03B(2)(e) Debonding Prestressing Strands

Where shown, debond prestressing strands by encasing the strands in plastic sheathing along the entire length shown and sealing the ends of the sheathing with waterproof tape.

Distribute the debonded strands symmetrically about the vertical centerline of the girder. The debonded lengths of pairs of strands must be equal.

Do not terminate debonding at any one cross section of the member for more than 40 percent of the debonded strands or 4 strands, whichever is greater.

Thoroughly seal the ends with waterproof tape to prevent the intrusion of water or cement paste before placing the concrete.

^^

51 CONCRETE STRUCTURES

07-19-13

Replace the paragraphs of section 51-1.01A with:

10-19-12

Section 51-1 includes general specifications for constructing concrete structures.

Earthwork for the following concrete structures must comply with section 19-3:

1. Sound wall footings
2. Sound wall pile caps
3. Culverts
4. Barrier slabs
5. Junction structures
6. Minor structures

7. Pipe culvert headwalls, endwalls, and wingwalls for a pipe with a diameter of 5 feet or greater

Falsework must comply with section 48-2.

Joints must comply with section 51-2.

Elastomeric bearing pads must comply with section 51-3.

Reinforcement for the following concrete structures must comply with section 52:

1. Sound wall footings
2. Sound wall pile caps
3. Barrier slabs
4. Junction structures
5. Minor structures
6. PC concrete members

You may use RSC for a concrete structure only where the specifications allow the use of RSC.

Replace "sets" in the 1st paragraph of section 51-1.01C(2) with:

07-19-13

copies

Replace the heading of section 51-1.01D(4) with:

04-19-13

Testing Concrete Surfaces

Add to section 51-1.01D(4)(a):

04-19-13

The Engineer tests POC deck surfaces for smoothness and crack intensity.

Add to the list in the 1st paragraph of section 51-1.01D(4)(b):

04-19-13

3. Completed deck surfaces, including ramps and landings of POCs

Replace the 4th paragraph in section 51-1.01D(4)(b) with:

04-19-13

Except for POCs, surface smoothness is tested using a bridge profilograph under California Test 547. Two profiles are obtained in each lane approximately 3 feet from the lane lines and 1 profile is obtained in each shoulder approximately 3 feet from the curb or rail face. Profiles are taken parallel to the direction of traffic.

Add between the 5th and 6th paragraphs of section 51-1.01D(4)(b):

04-19-13

POC deck surfaces must comply with the following smoothness requirements:

1. Surfaces between grade changes must not vary more than 0.02 foot from the lower edge of a 12-foot-long straightedge placed parallel to the centerline of the POC
2. Surface must not vary more than 0.01 foot from the lower edge of a 6-foot-long straightedge placed perpendicular to the centerline of the POC

Add to section 51-1.01D(4)(d):

04-19-13

The Engineer measures crack intensity of POC deck surfaces after curing, before prestressing, and before falsework release. Clean the surface for the Engineer to measure surface crack intensity.

In any 100 sq ft portion of a new POC deck surface, if there are more than 10 feet of cracks having a width at any point of over 0.02 inch, treat the deck with methacrylate resin under section 15-5.05. Treat the entire deck width between the curbs to 5 feet beyond where the furthest continuous crack emanating from the 100 sq ft section is 0.02 inch wide. Treat the deck surface before grinding.

Replace the 2nd paragraph of section 51-1.02B with:

07-19-13

Except for minor structures, the minimum required 28-day compressive strength for concrete in structures or portions of structures is the compressive strength described or 3,600 psi, whichever is greater.

Add to section 51-1.03C(2)(c)(i):

04-20-12

Permanent steel deck forms are only allowed where shown or if specified as an option in the special provisions.

Replace the 3rd paragraph of section 51-1.03C(2)(c)(ii) with:

04-20-12

Compute the physical design properties under AISI's *North American Specification for the Design of Cold-Formed Steel Structural Members*.

Replace the 8th paragraph of section 51-1.03D(1) with:

10-19-12

Except for concrete placed as pipe culvert headwalls and endwalls, slope paving and aprons, and concrete placed under water, consolidate concrete using high-frequency internal vibrators within 15 minutes of placing concrete in the forms. Do not attach vibrators to or hold them against forms or reinforcing steel. Do not displace reinforcement, ducts, or prestressing steel during vibrating.

Add to section 51-1.03E(5):

08-05-11

Drill the holes without damaging the adjacent concrete. 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.

Add to section 51-1.03F(5)(a):

04-19-13

For approach slabs, sleeper slabs, and other roadway surfaces of concrete structures, texture the roadway surface as specified for bridge deck surfaces in section 51-1.03F(5)(b).

Replace "Reserved" in section 51-1.03F(5)(b) with:

04-20-12

51-1.03F(5)(b)(i) General

Except for bridge widenings, texture the bridge deck surfaces longitudinally by grinding and grooving or by longitudinal tining.

10-19-12

For bridge widenings, texture the deck surface longitudinally by longitudinal tining.

04-20-12

In freeze-thaw areas, do not texture PCC surfaces of bridge decks.

51-1.03F(5)(b)(ii) Grinding and Grooving

When texturing the deck surface by grinding and grooving, place a 1/4 inch of sacrificial concrete cover on the bridge deck above the finished grade shown. Place items to be embedded in the concrete based on the final profile grade elevations shown. Construct joint seals after completing the grinding and grooving.

Before grinding and grooving, deck surfaces must comply with the smoothness and deck crack treatment requirements.

Grind and groove the deck surface as follows:

1. Grind the surface to within 18 inches of the toe of the barrier under section 42-3. Grinding must not reduce the concrete cover on reinforcing steel to less than 1-3/4 inches.
2. Groove the ground surfaces longitudinally under section 42-2. The grooves must be parallel to the centerline.

51-1.03F(5)(b)(iii) Longitudinal Tining

When texturing the deck surface by longitudinal tining, perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with spring steel tines that produce grooves parallel with the centerline.

The tines must:

1. Be rectangular in cross section
2. Be from 3/32 to 1/8 inch wide on 3/4-inch centers
3. Have enough length, thickness, and resilience to form grooves approximately 3/16 inch deep

Construct grooves to within 6 inches of the layout line of the concrete barrier toe. Grooves must be from 1/8 to 3/16 inch deep and 3/16 inch wide after concrete has hardened.

For irregular areas and areas inaccessible to the grooving machine, you may hand construct grooves. Hand-constructed grooves must comply with the specifications for machine-constructed grooves.

Tining must not cause tearing of the deck surface or visible separation of coarse aggregate at the surface.

Add to section 51-1.03F:

04-19-13

51-1.03F(6) Finishing Pedestrian Overcrossing Surfaces

Construct deck surfaces, including ramps and landings of POCs to the grade and cross section shown. Surfaces must comply with the specified smoothness, surface texture, and surface crack requirements.

The Engineer sets deck elevation control points for your use in establishing the grade and cross section of the deck surface. The grade established by the deck elevation control points includes all camber allowances. Except for landings, elevation control points include the beginning and end of the ramp and will not be closer together than approximately 8 feet longitudinally and 4 feet transversely to the POC centerline. Landing elevation control points are at the beginning and the end of the landing.

Broom finish the deck surfaces of POCs. Apply the broom finish perpendicular to the path of travel. You may apply water mist to the surface immediately before brooming.

Clean any discolored concrete by abrasive blast cleaning or other authorized methods.

Replace the paragraphs of section 51-1.04 with:

10-19-12

If concrete involved in bridge work is not designated by type and is not otherwise paid for under a separate bid item, the concrete is paid for as structural concrete, bridge.

The payment quantity for structural concrete includes the volume in the concrete occupied by bar reinforcing steel, structural steel, prestressing steel materials, and piling.

The payment quantity for seal course concrete is the actual volume of seal course concrete placed except the payment quantity must not exceed the volume of concrete contained between vertical planes 1 foot outside the neat lines of the seal course shown. The Department does not adjust the unit price for an increase or decrease in the seal course concrete quantity.

Structural concrete for pier columns is measured as follows:

1. Horizontal limits are vertical planes at the neat lines of the pier column shown.
2. Bottom limit is the bottom of the foundation excavation in the completed work.
3. Upper limit is the top of the pier column concrete shown.

The payment quantity for drill and bond dowel is determined from the number and depths of the holes shown.

Replace section 51-2.01B(2) with:

04-19-13

51-2.01B(2) Reserved

04-19-13

Delete the 4th paragraph of section 51-2.01C.

Replace "SSPC-QP 3" in the 1st paragraph of section 51-2.02A(2) with:

10-19-12

AISC-420-10/SSPC-QP 3

Replace the 2nd and 3rd paragraphs of section 51-2.02B(3)(b) with:

04-20-12

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.

Replace "sets" in the 1st and 2nd paragraphs of section 51-2.02D(1)(c)(ii) with:

04-19-13

copies

Replace "set" in the 7th paragraph of section 51-2.02D(1)(c)(ii) with:

04-19-13

copy

Add to the 1st paragraph of section 51-2.02D(3):

04-19-13

POC deck surfaces must comply with section 51-1.03F(6) before placing and anchoring joint seal assemblies.

Replace "sets" in the 2nd paragraph of section 51-2.02E(1)(c) with:

04-19-13

copies

Replace "set" in the 6th paragraph of section 51-2.02E(1)(c) with:

04-19-13

copy

Replace the 2nd paragraph of section 51-2.02E(1)(e) with:

08-05-11

Except for components in contact with the tires, the design loading must be the AASHTO LRFD Bridge Design Specifications Design Truck with 100 percent dynamic load allowance. Each component in contact with the tires must support a minimum of 80 percent of the AASHTO LRFD Bridge Design Specifications Design Truck with 100 percent dynamic load allowance. The tire contact area must be 10 inches measured normal to the longitudinal assembly axis by 20 inches wide. The assembly must provide a smooth-riding joint without slapping of components or tire rumble.

Replace "sets" in the 1st and 2nd paragraphs of section 51-2.02F(1)(c) with:

04-19-13

copies

Add between the 1st and 2nd paragraphs of section 51-4.01A:

10-19-12

Prestressing concrete members must comply with section 50.

04-20-12

Delete the 2nd paragraph of section 51-4.01A.

Replace the 3rd paragraph of section 51-4.01C(2) with:

04-20-12

For segmental or spliced-girder construction, shop drawings must include the following additional information:

1. Details showing construction joints or closure joints
2. Arrangement of bar reinforcing steel, prestressing tendons, and pressure-grouting pipe
3. Materials and methods for making closures
4. Construction joint keys and surface treatment
5. Other requested information

For segmental girder construction, shop drawings must include concrete form and casting details.

Replace "sets" in the 1st paragraph of section 51-4.01C(3) with:

04-19-13

copies

10-19-12

Delete the 1st and 2nd paragraphs of section 51-4.02A.

Replace the 3rd paragraph of section 51-4.02B(2) with:

04-20-12

For segmental or spliced-girder construction, materials for construction joints or closure joints at exterior girders must match the color and texture of the adjoining concrete.

Add to section 51-4.02B(2):

04-20-12

At spliced-girder closure joints:

1. If shear keys are not shown, the vertical surfaces of the girder segment ends must be given a coarse texture as specified for the top surface of PC members.
2. Post-tensioning ducts must extend out of the vertical surface of the girder segment closure end sufficiently to facilitate splicing of the duct.

For spliced girders, pretension strand extending from the closure end of the girder segment to be embedded in the closure joint must be free of mortar, oil, dirt, excessive mill scale and scabby rust, and other coatings that would destroy or reduce the bond.

Add to section 51-4.03B:

04-20-12

The specifications for prestressing force distribution and sequencing of stressing in the post-tensioning activity in 50-1.03B(2)(a) do not apply if post-tensioning of spliced girders before starting deck construction is described. The composite deck-girder structure must be post-tensioned in a subsequent stage.

Temporary spliced-girder supports must comply with the specifications for falsework in section 48-2.

Before post-tensioning of spliced girders, remove the forms at CIP concrete closures and intermediate diaphragms to allow inspection for concrete consolidation.

Add to section 51-5.01A:

07-19-13

Structure excavation and backfill must comply with section 19-3.

Treated permeable base must comply with section 29.

07-19-13

Delete the 1st paragraph of section 51-5.03B(3).

07-19-13

Delete the 2nd paragraph of section 51-5.03D(1).

Add between the 1st and 2nd paragraphs of section 51-7.01A:

10-19-12

Minor structures include:

1. Pipe culvert headwalls and endwalls for a pipe with a diameter less than 5 feet
2. Drainage inlets
3. Other structures described as minor structures

10-19-12

Delete the 4th paragraph of section 51-7.01A.

Replace the 1st and 2nd paragraphs of section 51-7.01B with:

10-19-12

Concrete must comply with the specifications for minor concrete.

Add to section 51:

10-19-12

51-8–51-15 RESERVED

^^

52 REINFORCEMENT

01-18-13

Add to section 52-1.01A:

07-20-12

Splicing of bar reinforcement must comply with section 52-6.

Replace the 1st and 2nd paragraphs of section 52-1.02B with:

10-19-12

Reinforcing bars must be deformed bars complying with ASTM A 706/A 706M, Grade 60, except you may use:

1. Deformed bars complying with ASTM A 615/A 615M, Grade 60, in:
   - 1.1. Junction structures
   - 1.2. Sign and signal foundations
   - 1.3. Minor structures
   - 1.4. Concrete crib members
   - 1.5. Mechanically-stabilized-embankment concrete panels
   - 1.6. Masonry block sound walls
2. Deformed or plain bars complying with ASTM A 615/A 615M, Grade 40 or 60, in:
   - 2.1. Slope and channel paving
   - 2.2. Concrete barriers Type 50 and 60
3. Plain bars for spiral or hoop reinforcement in structures and concrete piles

Add to the list in the 3rd paragraph of section 52-1.02B:

04-20-12

9. Shear reinforcement stirrups in PC girders

Replace the 6th paragraph of section 52-6.01D(4)(a) with:

01-18-13

Before performing service splice or ultimate butt splice testing, perform total slip testing on the service splice or ultimate butt splice test samples under section 52-6.01D(4)(b).

Replace section 52-6.02D with:

10-21-11

52-6.02D Ultimate Butt Splice Requirements

When tested under California Test 670, ultimate butt splice test samples must demonstrate necking as either of the following:

1. For "Necking (Option I)," the test sample must rupture in the reinforcing bar outside of the affected zone and show visible necking.
2. For "Necking (Option II)," the largest measured strain must be at least:
   2.1. Six percent for no. 11 and larger bars
   2.2. Nine percent for no. 10 and smaller bars

Replace the 2nd and 3rd paragraphs of section 52-6.03B with:

01-18-13

Do not splice the following by lapping:

1. No. 14 bars
2. No. 18 bars
3. Hoops
4. Reinforcing bars where you cannot provide a minimum clear distance of 2 inches between the splice and the nearest adjacent bar

^^

53 SHOTCRETE

07-19-13

Replace the 2nd and 3rd paragraphs of section 53-2.01D(1) with:

07-19-13

Obtain and test all cores for compressive strength under ASTM C 42/C 42M at an authorized laboratory. The compressive strength is the average strength of the 3 cores.

Shotcrete must have a minimum compressive strength of 3,600 psi, unless otherwise described. The shotcrete must attain the minimum compressive strength at 28 days, except 42 days are allowed for shotcrete with a described minimum compressive strength greater than 3,600 psi.

^^

54 WATERPROOFING

07-19-13

Add between "be" and "3/8 inch" in the 3rd paragraph of section 54-4.02C:

04-20-12

at least

Add to section 54:

07-19-13

54-7 SILANE WATERPROOFING TREATMENT

Reserved

54-8–54-10 RESERVED

^^

55 STEEL STRUCTURES

07-19-13

07-19-13

Delete the 3rd paragraph in section 55-1.01C(1).

Replace the 3rd sentence of the 4th paragraph in section 55-1.01C(1) with:

07-19-13

For ASTM F 1554 anchor bolts, include chemical composition and carbon equivalence for each heat of steel.

Add to section 55-1.01C(1):

07-19-13

For HS connections, submit a record of which lots are used in each joint as an informational submittal.

Replace "sets" at each occurrence in the 1st paragraph of section 55-1.01C(2) with:

04-19-13

copies

Replace the list in the 2nd paragraph of section 55-1.01C(2) with:

07-19-13

1. Sequence of shop and field assembly and erection. For continuous members, include proposed steel erection procedures with calculations that show girder capacity and geometry will be correct.
2. Welding sequences and procedures.
3. Layout drawing of the entire structure with locations of butt welded splices.
4. Locations of temporary supports and welds.
5. Vertical alignment of girders at each stage of erection.
6. Match-marking diagrams.
7. Details for connections not shown or dimensioned on the plans.
8. Details of allowed options incorporated in the work.
9. Direction of rolling of plates where orientation is specified.
10. Distortion control plan.
11. Dimensional tolerances. Include measures for controlling accumulated error to meet overall tolerances.

12. Material specification and grade listed on the bill of materials.
13. Identification of tension members and fracture critical members.
14. Proposed deviations from plans, specifications, or previously submitted shop drawings.
15. Contract plan sheet references for details.

Replace items 2 and 3 in the list in the 1st paragraph of section 55-1.01C(3) with:

07-19-13

2. Tension flanges and webs of horizontally curved girders
3. Hanger plates

Replace the 2nd paragraph of section 55-1.01C(3) with:

07-19-13

Furnish plates, shapes, or bars with extra length to provide for removal of check samples.

07-19-13

Delete the 1st and 2nd sentences in the 3rd paragraph of section 55-1.01C(3).

Replace the 4th paragraph of section 55-1.01C(3) with:

07-19-13

Remove material for test samples in the Engineer's presence. Test samples for plates over 24 inches wide must be 10 by 12 inches with the long dimension transverse to the direction of rolling. Test samples for other products must be 12 inches long taken in the direction of rolling with a width equal to the product width.

Replace the 1st sentence of the 6th paragraph in section 55-1.01C(3) with:

07-19-13

Results of check testing are delivered to you within 20 days of receipt of samples at METS.

07-19-13

Delete the 2nd paragraph of section 55-1.01D(1).

Replace the 2nd sentence of the 4th paragraph in section 55-1.01D(1) with:

07-19-13

The calibration must be performed by an authorized repair and calibration center approved by the tool manufacturer.

Add to section 55-1.01D(1):

07-19-13

For bolts installed as snug tight, rotational capacity testing and installation tension testing are not required.

In addition to NDT requirements in AWS D1.5, ultrasonically test 25 percent of all main member tension butt welds in material over 1/2 inch thick.

Perform NDT on 100 percent of each pin as follows:

1. MT under ASTM A 788, S 18, with no linear indication allowed exceeding 3 mm
2. UT under ASTM A 788, S 20, level S and level DA in two perpendicular directions

The Engineer determines the location of all NDT testing for welding.

07-19-13

Delete the 2nd paragraph of section 55-1.01D(3)(a).

Replace section 55-1.01D(4)(b) with:

07-19-13

Perform rotational capacity testing on each rotational capacity lot under section 55-1.01D(3)(b) at the job site before installation.

Replace the 1st sentence of the 2nd paragraph in section 55-1.01D(4)(c) with:

07-19-13

Test 3 representative HS fastener assemblies under section 8 of *Specification for Structural Joints Using High-Strength Bolts* of the RCSC.

Replace the 1st paragraph in section 55-1.01D(4)(d) with:

07-19-13

Perform fastener tension testing to verify minimum tension in HS bolted connections no later than 48 hours after all fasteners in a connection have been tensioned.

Replace the 3rd paragraph in section 55-1.01D(4)(d) with:

07-19-13

Test 10 percent of each type of fastener assembly in each HS bolted connection for minimum tension using the procedure described in section 10 of *Specification for Structural Joints Using High-Strength Bolts* of the RCSC. Check at least 2 assemblies per connection. For short bolts, determine the inspection torque using steps 1 through 7 of "Arbitration of Disputes, Torque Method-Short Bolts" in *Structural Bolting Handbook* of the Steel Structures Technology Center.

Replace the 1st table in the 1st paragraph of section 55-1.02A(1) with:

07-19-13

Structural Steel

Material	Specification
Carbon steel	ASTM A 709/A 709M, Grade 36 or {ASTM A36/A36M}[a]
HS low alloy columbium vanadium steel	ASTM A 709/A 709M, Grade 50 or {ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50}[a]
HS low alloy structural steel	ASTM A 709/A 709M, Grade 50W or Grade HPS 50W, or {ASTM A 588/A 588M}[a]
HS low alloy structural steel plate	ASTM A 709/A 709M, Grade HPS 70W
High-yield strength quenched and tempered alloy steel plate suitable for welding	ASTM A 709/A 709M, Grade 100, Grade 100W, or Grade HPS 100W, or {ASTM A 514/A 514M}[a]

[a]Grades you may substitute for the equivalent ASTM A 709 steel subject to the modifications and additions specified and to the requirements of ASTM A 709.

Replace the 2nd table in the 1st paragraph of section 55-1.02A(1) with:

07-19-13

Fasteners

Material	Specification
Steel fastener components for general applications:	
Bolts and studs	ASTM A 307
Anchor bolts	ASTM F 1554[a]
HS bolts and studs	ASTM A 449, Type 1[a]
HS threaded rods	ASTM A 449, Type 1 [a]
HS nonheaded anchor bolts	ASTM F 1554, Grade 105, Class 2A[a]
Nuts	ASTM A 563, including appendix X1[b]
Washers	ASTM F 844
Hardened Washers	ASTM F 436, Type 1, including S1 supplementary requirements
Components of HS steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM A 325, Type 1
Tension control bolts	ASTM F 1852, Type 1
Nuts	ASTM A 563, including appendix X1[b]
Hardened washers	ASTM F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM F 959, Type 325, zinc-coated

[a]Use hardened washers.
[b]Zinc-coated nuts tightened beyond snug or wrench tight must be furnished with a dry lubricant complying with supplementary requirement S2 in ASTM A 563.

Replace the 3rd table in the 1st paragraph of section 55-1.02A(1) with:

07-19-13

Other Materials

Material	Specification
Carbon steel for forgings, pins, and rollers	ASTM A 668/A 668M, Class D
Alloy steel for forgings	ASTM A 668/A 668M, Class G
Pin nuts	ASTM A 709/A 709M or ASTM A 563, including appendix X1[a]
Carbon-steel castings	ASTM A 27/A 27M, Grade 65-35, Class 1
Malleable iron castings	ASTM A 47/A 47M, Grade 32510
Gray iron castings	ASTM A 48, Class 30B
Carbon steel structural tubing	ASTM A 500/A 500M, Grade B, ASTM A 501, ASTM A 847/A 847M, or ASTM A 1085
Steel pipe[b]	ASTM A 53, Type E or S, Grade B; ASTM A 106, Grade B; or ASTM A 139, Grade B
Stud connectors	ASTM A 108

[a]Zinc-coated nuts tightened beyond snug or wrench tight must be furnished with a dry lubricant complying with supplementary requirement S2 in ASTM A 563.
[b]Hydrostatic testing will not apply.

Replace the table in the 1st paragraph in section 55-1.02A(2) with:

07-19-13

Material complying with ASTM A 709/A 709M	CVN impact value (ft-lb at temperature)
Grade 36	15 at 40 ºF
Grade 50[a] (Thickness up to 2 inches)	15 at 40 ºF
Grade 50W[a] (Thickness up to 2 inches)	15 at 40 ºF
Grade 50[a] (Thickness over 2 inches up to 4 inches)	20 at 40 ºF
Grade 50W[a] (Thickness over 2 inches up to 4 inches)	20 at 40 ºF
Grade HPS 50W[a] (Thickness up to 4 inches)	20 at 10 ºF
Grade HPS 70W (Thickness up to 4 inches)	25 at -10 ºF
Grade 100 (Thickness of 2-1/2 inches or less)	25 at 0 ºF
Grade 100W (Thickness over 2-1/2 inches up to 4 inches)	35 at 0 ºF
Grade HPS 100W (Thickness of 2-1/2 inches or less)	25 at -30 ºF
Grade HPS 100W (Thickness over 2-1/2 inches up to 4 inches)	35 at -30 ºF

[a]If the material yield strength is more than 65,000 psi, reduce the temperature for the CVN impact value 15 degrees F for each increment of 10,000 psi above 65,000 psi.

Replace the 1st sentence of the 1st paragraph in section 55-1.02A(5) with:

07-19-13

Steel, gray iron, and malleable iron castings must have continuous fillets cast in place in reentrant angles.

07-19-13

Delete the 3rd and 4th sentences in the 2nd paragraph in section 55-1.02A(5).

Replace the 1st paragraph of section 55-1.02B(1) with:

07-19-13

Section 55-1.02B(1) applies to work performed at the source and at the job site.

Replace the 4th paragraph in section 55-1.02B(1) with:

07-19-13

Ends of girder stiffeners shown as tight-fit must bear on the girder flange with at least point bearing. Local clearances between the end of the stiffener and the girder flange must be at most 1/16 inch.

Replace the 1st sentence of the 5th paragraph in section 55-1.02B(1) with:

07-19-13

Fabricate floor beams, stringers, and girders having end connection angles to exact length back to back of connection angles.

Add to the 7th paragraph in section 55-1.02B(1):

07-19-13

Use low-stress stamps for fracture critical members and tension members.

Replace the 2nd sentence of the 9th paragraph in section 55-1.02B(1) with:

07-19-13

Slightly round edges and sharp corners, including edges marred, cut, or roughened during handling or erection.

Replace the 3rd paragraph in section 55-1.02B(2) with:

07-19-13

Instead of machining, you may heat straighten steel not in contact with other metal bearing surfaces if the above tolerances are met.

Replace item 2 in the list in the 1st paragraph of section 55-1.02B(3) with:

07-19-13

2. Radius of bend measured to the concave face must comply with *Manual of Steel Construction* of the AISC

Replace the 1st sentence of the 2nd paragraph in section 55-1.02B(3) with:

07-19-13

Plates to be bent to a smaller radius than specified in *Manual of Steel Construction* of the AISC must be bent hot.

Replace the introductory clause of the 2nd paragraph of section 55-1.02B(4) with:

07-19-13

Threads for pin ends and pin nuts 1-1/2 inches or more in diameter must comply with the following:

Replace the 3rd paragraph in section 55-1.02B(5) with:

07-19-13

Holes for pins must be:

1. True to the diameter specified.
2. At right angles to the member axis.
3. Parallel with each other except for pins where nonparallel holes are required.
4. Smooth and straight with the final surface produced by a finishing cut.

Replace the 1st paragraph in section 55-1.02B(6)(c) with:

07-19-13

Bolted connections using HS fastener assemblies must comply with *Specification for Structural Joints Using High-Strength Bolts* of the RCSC.

Replace the 7th paragraph in section 55-1.02B(6)(c) with:

07-19-13

For all bolts, thread stickout after tensioning must be at least flush with the outer nut face. At least 3 full threads must be located within the grip of the connection.

07-19-13

Delete the 3rd paragraph in section 55-1.02B(7)(a).

Add to section 55-1.02B(7)(a):

07-19-13

For welds indicated to be subject to tensile forces that are to receive RT, grind smooth and flush on both sides of welds before testing.

For groove weld surface profiles that interfere with NDT procedures, grind welds smooth and blend with the adjacent material.

For fillet weld surface profiles that interfere with NDT procedures, grind welds and blend the toes smoothly with the adjacent base metal.

Add to section 55-1.02B(7):

07-19-13

55-1.02B(7)(c) Steel Pedestrian Bridges

Reserved

Replace the 1st paragraph in section 55-1.02B(9) with:

07-19-13

Prepare and paint contact surfaces of HS bolted connections before assembly. Thoroughly clean all other surfaces of metal in contact to bare metal before assembly. Remove all rust, mill scale, and foreign material.

Replace the 1st sentence of the 4th paragraph in section 55-1.02B(9) with:

07-19-13

Preassemble truss work in lengths of at least 3 abutting panels and adjust members for line and camber.

Replace the 1st sentence of the 5th paragraph in section 55-1.02B(9) with:

07-19-13

Preassemble bolted splice joints for plate girders in lengths of at least 3 abutting sections and adjust abutting sections for line and camber.

Replace the 6th paragraph in section 55-1.02B(9) with:

07-19-13

Preassemble prepared splice joints for welded girders with abutting members and adjust for line and camber.

Replace the paragraphs in section 55-1.03C(1) with:

07-19-13

Reserved

Replace the 3rd sentence of the 1st paragraph in section 55-1.03C(2) with:

07-19-13

Attain full bearing on the concrete under bearing assemblies.

Replace the 3rd paragraph in section 55-1.03C(2) with:

07-19-13

During welding, protect bearings and bearing surfaces using authorized methods.

Replace section 55-1.03C(4) with:

07-19-13

55-1.03C(4) Continuous Members

Unless otherwise shown, structural steel girders are designed for continuity in supporting girder dead load. If erection procedures provide girder continuity for dead load, preassemble members with field joints in a no-load condition in a horizontal or an upright condition.

You may erect structural steel girders such that dead load girder continuity is not provided. If erection procedures do not provide girder continuity for dead load:

1. You may increase cross-sectional areas or change grades of steel to provide the specified capacity if authorized.
2. After erection, the erected structure must have a load-carrying capacity at least equal to the structure shown.

^^

56 SIGNS

07-19-13

Replace the 4th paragraph of section 56-3.01A with:

07-19-13

The types of sign structures include:

1. Truss
2. Bridge mounted
3. Tubular

Replace "sets" in the 1st paragraph of section 56-3.01C(2) with:

04-19-13

copies

07-20-12

Delete the 7th paragraph of section 56-3.02K(2).

Replace the 1st paragraph of section 56-3.02M(1) with:

07-19-13

Galvanize all ferrous metal parts of the following sign structure types:

1. Truss
2. Bridge mounted
3. Tubular

Add between the 1st and 2nd paragraphs of section 56-3.02M(1):

04-19-13

Clean and paint all ferrous metal parts of tubular sign structures after galvanizing, including the areas to be covered by sign panels. Do not paint sign structures other than tubular type unless specified in the special provisions.

Replace the headings and paragraphs in section 56-3.02M(3) with:

04-19-13

Where specified, clean and paint sign structures under section 59-5.

^^

57 WOOD AND PLASTIC LUMBER STRUCTURES

04-19-13

Replace "51-2.01C(3)" in the 1st paragraph of section 57-2.01C(3)(a) with:

10-19-12

57-2.01C(3)

Replace "sets" at each occurrence in the 1st paragraph of section 57-3.01C with:

04-19-13

copies

^^

58 SOUND WALLS

04-19-13

10-19-12

Delete the 3rd paragraph of section 58-1.01.

Replace the 1st paragraph of section 58-2.01D(5)(a) with:

08-05-11

You must employ a special inspector and an authorized laboratory to perform Level 1 inspections and structural tests of masonry to verify the masonry construction complies with section 1704, "Special Inspections," and section 2105, "Quality Assurance," of the 2007 CBC.

10-19-12

Delete the 1st paragraph of section 58-2.02F.

Replace "sets" at each occurrence in the 1st paragraph of section 58-4.01C with:

04-19-13

copies

^^

59 PAINTING

07-19-13

Replace "SSPC-SP 10" at each occurrence in section 59 with:

10-19-12

SSPC-SP 10/NACE no. 2

Replace "SSPC-SP 6" at each occurrence in section 59 with:

10-19-12

SSPC-SP 6/NACE no. 3

Replace "SSPC-CS 23.00" at each occurrence in section 59 with:

10-19-12

SSPC-CS 23.00/AWS C 2.23M/NACE no. 12

Replace "*Specification for Structural Joints Using ASTM A325 or A 490 Bolts*" in the 1st paragraph of section 59-2.01C(1) with:

07-19-13

Specification for Structural Joints Using High-Strength Bolts

Replace "SSPC-QP 3 or AISC SPE, Certification P-1 Enclosed" in item 3 in the list in the 1st paragraph of section 59-2.01D(1) with:

10-19-12

AISC-420-10/SSPC-QP 3 (Enclosed Shop)

Replace "*Specification for Structural Joints Using ASTM A325 or A 490 Bolts*" in the 1st paragraph of section 59-2.02 with:

07-19-13

Specification for Structural Joints Using High-Strength Bolts

Replace the paragraphs in section 59-2.03A with:

10-19-12

Clean and paint all exposed structural steel and other metal surfaces.

You must provide enclosures for cleaning and painting structural steel. Cleaning and painting of new structural steel must be performed in an Enclosed Shop as defined in AISC-420-10/SSPC-QP 3. Maintain atmospheric conditions inside enclosures within specified limits.

Except for blast cleaning within closed buildings, perform blast cleaning and painting during daylight hours.

Add to section 59-2.03B:

07-19-13

59-2.03B(3) Containment Systems

59-2.03B(3)(a) General

Construct containment systems when disturbing existing paint systems during bridge rehabilitation.

The containment system must be one of the following:

1. Ventilated containment system
2. Vacuum-shrouded surface preparation equipment and drapes and ground covers
3. Equivalent containment system if authorized

The containment system must contain all water, resulting debris, and visible dust produced when the existing paint system is disturbed.

Properly maintain the containment system while work is in progress and do not change the containment system unless authorized.

Containment systems over railroad property must provide the minimum clearances as specified in section 5-1.20C for the passage of railroad traffic.

59-2.03B(3)(b) Ventilated Containment Systems

59-2.03B(3)(b)(i) General

If flexible framing is used, support and fasten it to (1) prevent the escape of abrasive and blast materials due to whipping from traffic or wind and (2) maintain clearances.

If the wind speed reaches 50 mph or greater, relieve the wind pressure on the containment system using an authorized method.

59-2.03B(3)(b)(ii) Design Criteria

Scaffolding or supports for the ventilated containment system must not extend below the vertical clearance level nor to the ground line at locations within the roadbed.

For truss-type bridges, all connections of the ventilated containment system to the existing structure must be made through the deck, girder, stringer, or floor beam system. No connections are allowed that will cause bending stresses in a truss member.

The ventilated containment system must comply with section 7-1.02K(6)(e).

The minimum total design load for the ventilated containment system must consist of the sum of the dead and live vertical loads.

Dead and live loads are as follows:

1. Dead load must consist of the actual load of the ventilated containment system
2. Live loads for bridges with only spot blast cleaning work must consist of:
   - 2.1. Uniform load of at least 25 psf applied over the supported area
   - 2.2. Moving concentrated load of 1000 lb to produce maximum stress in the main supporting elements of the ventilated containment system
3. Live loads for bridges with 100 percent blast cleaning to bare metal must consist of:
   - 3.1. Uniform load of at least 45 psf, which includes 20 psf of sand load, applied over the supported area
   - 3.2. Moving concentrated load of 1000 lb to produce maximum stress in the main supporting elements of the ventilated containment system

Assumed horizontal loads do not need to be included in the design of the ventilated containment system.

Maximum allowable stresses must comply with section 48-2.01D(3)(c).

59-2.03B(3)(b)(iii) Ventilation

The ventilation system in the ventilated containment system must be of the forced input airflow type with fans or blowers.

Negative air pressure must be employed within the ventilated containment system and will be verified by visual methods by observing the concave nature of the ventilated containment system while taking into account wind effects or by using smoke or other visible means to observe airflow. The input airflow must be properly balanced with the exhaust capacity throughout the range of operations.

The exhaust airflow of the ventilation system in the ventilated containment system must be forced into wet or dry dust collectors or bag houses.

Replace item 1 in the list in the 2nd paragraph of section 59-2.03C(1) with:

10-19-12

1. Apply a stripe coat of undercoat paint on all edges, corners, seams, crevices, interior angles, junctions of joining members, weld lines, and similar surface irregularities. The stripe coat must completely hide the surface being covered. If spot blast cleaning portions of the bridge, apply the stripe coat of undercoat paint before each undercoat and follow with the undercoat as soon as practical. If removing all existing paint from the bridge, apply the undercoat first as soon as practical and follow with the stripe coat of undercoat paint for each undercoat.

Replace the heading of section 59-2.03C(2) with:

04-19-13

Zinc Coating System

Add to section 59-2.03C(2)(a):

04-19-13

Coatings for new structural steel and connections between new and existing structural steel must comply with the requirements shown in the following table:

Zinc Coating System

Description	Coating	Dry film thickness (mils)
All new surfaces:		
Undercoat	Inorganic zinc primer, AASHTO M 300 Type I or II	4–8
Finish coat[a]	Exterior grade latex[b], 2 coats	2 minimum each coat, 4–8 total
Total thickness, all coats		8–14
Connections to existing structural steel:[c]		
Undercoat	Inorganic zinc primer, AASHTO M 300 Type I or II	4–8
Finish coat[a]	Exterior grade latex[b], 2 coats	2 minimum each coat, 4–8 total
Total thickness, all coats		8–14

[a]If no finish coats are described, a final coat of inorganic zinc primer is required.
[b]Exterior grade latex must comply with section 91-2.02 unless otherwise specified.
[c]Includes the following locations:

1. New and existing contact surfaces
2. Existing member surfaces under new HS bolt heads, nuts, or washers
3. Bare surfaces of existing steel after trimming, cutting, drilling, or reaming
4. Areas within a 4-inch radius from the point of application of heat for welding or flame cutting

Replace "*Specification for Structural Joints Using ASTM A325 or A 490 Bolts*" in the 7th paragraph of section 59-2.03C(2)(b)(i) with:

07-19-13

Specification for Structural Joints Using High-Strength Bolts

Add to section 59-2.03C:

04-19-13

59-2.03C(3) Moisture-Cured Polyurethane Coating System

Reserved

59-2.03C(4) State Specification Paint Waterborne Coating System

59-2.03C(4)(a) General

The State Specification PWB coating system for existing structural steel must comply with the requirements shown in the following table:

State Specification PWB Coating System

Surface	Description	State Specification PWB Coating	Dry film thickness (mils)
Surfaces cleaned to bare metal[a]:	1st undercoat	145	2–3
	2nd undercoat	146	2–3
	1st finish coat	171	1.5–3
	2nd finish coat	172	1.5–3
	Total thickness, all coats	--	7–12
Existing painted surfaces to be topcoated:	Undercoat	146	2–3
	1st finish coat	171	1.5–3
	2nd finish coat	172	1.5–3
	Total thickness, new coats	--	5–9

[a]Includes locations of spot blast cleaning

59-2.03C(4)(b) Finish Coats

Pressure rinse undercoated surfaces to receive finish coats. Perform pressure rinsing no sooner than 72 hours after the final application of undercoat.

The 1st finish coat must be applied within 48 hours of pressure rinsing.

Apply the 1st finish coat in 2 applications. The 1st application consists of a spray-applied mist application. Apply the 2nd application after the mist application has dried to a set-to-touch condition as determined using the procedure in section 7 of ASTM D 1640.

Apply the 2nd finish coat after the 1st finish coat has dried 12 hours unless authorized. You may apply the 2nd finish coat in a single application.

Add to section 59-5.01:

04-19-13

Where specified, prepare and paint sign structures under sections 59-2 and 59-3.

Instead of submitting proof of the certification complying with SSPC-QP 1, you may submit documentation with the painting quality work plan showing compliance with the requirements in section 3 of SSPC-QP 1.

Instead of submitting proof of the certification complying with SSPC-QP 2, you may submit documentation with the painting quality work plan showing compliance with the requirements in sections 4.2 through 4.4 of SSPC-QP 2, Category A.

Instead of submitting proof of the certification complying with AISC-420-10/SSPC-QP 3 (Enclosed Shop), you may submit documentation with the painting quality work plan showing compliance with the requirements in sections 5 through 18 of AISC-420-10/SSPC-QP3.

Replace the paragraphs of section 59-5.03 with:

04-19-13

59-5.03A General

You may prepare and paint sign structures before or after erection. After erection, repair damaged paint to the satisfaction of the Engineer.

The total dry film thickness of finish coats on contact surfaces of galvanized HS bolted connections (1) must be from 1 to 4 mils and (2) may be applied in 1 application.

59-5.03B Undercoating of Ungalvanized Surfaces

Blast-cleaned surfaces must receive a single undercoat consisting of an inorganic zinc coating as specified in AASHTO M 300, Type I or Type II, except:

1. The first 2 sentences of section 5.6 do not apply
2. Section 5.6.1 does not apply

If you propose to use a coating that is not on the Authorized Material List, submit the required documentation specified in section 5.6 of AASHTO M 300. Allow 30 days for the Engineer's review.

59-5.03C Testing of Inorganic Zinc Coating

Perform adhesion and hardness testing no sooner than 72 hours after application of the single undercoat of inorganic zinc coating.

59-5.03D Finish Coating

The exposed area of inorganic zinc coating must receive a minimum of 2 finish coats of exterior grade latex paint.

The 1st finish coat color must match no. 24558 of FED-STD-595. The 2nd finish coat color must match no. 24491 of FED-STD-595. The total dry film thickness of the applications of the 2nd finish coat must be not less than 2 mils.

Replace section 59-7 with:

07-19-13

59-7 STAINING CONCRETE AND SHOTCRETE

59-7.01 GENERAL

59-7.01A General

59-7.01A(1) Summary

Section 59-7.01 includes specifications for preparing and staining concrete and shotcrete surfaces using an acid stain.

59-7.01A(2) Definitions

Reserved

59-7.01A(3) Submittals

Submit stain manufacturer's product data and application instructions at least 7 days before starting staining activities.

59-7.01A(4) Quality Control and Assurance

Reserved

59-7.01B Materials

59-7.01B(1) General

Reserved

59-7.01B(2) Stain

Stain must:

1. Be a water-based solution of inorganic metallic salts
2. Contain dilute acid that penetrates and etches the concrete or shotcrete surface
3. Be a commercial quality product designed specifically for exterior applications
4. Produce abrasion-resistant color deposits

59-7.01B(3) Sealer

Reserved

59-7.01B(4) Joint Sealing Compound

Reserved

59-7.01C Construction

59-7.01C(1) General

Seal joints between concrete and shotcrete surfaces to be stained and adjacent metal with joint sealing compound before applying the stain.

Test surfaces for acceptance of the stain before applying the stain. Clean surfaces that resist accepting the stain and retest until passing.

Apply the stain under the manufacturer's instructions.

Before staining, the concrete or shotcrete surfaces must be:

1. At least 28 days old
2. Prepared under SSPC-SP 13/NACE no. 6
3. Thoroughly dry

Apply the stain uniformly to avoid excessive rundown. Work the stain into the concrete using a nylon bristle brush in a circular motion.

After the last coat of stain has dried, rinse stained surfaces with water and wet scrub with a stiff bristle nylon brush until the rinse water runs clear. Collect all rinse water.

Protect adjacent surfaces during staining.

Thoroughly cure each application of the stain and correct skips, holidays, thin areas, or other deficiencies before the next application.

Drips, puddles, or other irregularities must be worked into the concrete or shotcrete surface.

59-7.01C(2) Test Panel

For staining concrete or shotcrete, stain a test panel complying with section 51-1.01D(3).

For staining sculpted shotcrete, stain a test panel complying with 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 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.

59-7.01D Payment

Not Used

59-7.02 SCULPTED SHOTCRETE AND TEXTURED CONCRETE

59-7.02A General

59-7.02A(1) Summary

Section 59-7.02 includes specifications for preparing and staining sculpted shotcrete and textured concrete surfaces using an acid stain.

59-7.02A(2) Definitions

Reserved

59-7.02A(3) Submittals

59-7.02A(3)(a) General

Reserved

59-7.02A(3)(b) Experience Qualifications

Submit the following documentation of the staining subcontractor's experience at least 10 days before the preconstruction meeting:

1. Summary of the staining subcontractor's experience that demonstrates compliance with section 59-7.02A(4)(b).
2. List of at least 3 projects completed in the last 5 years that demonstrate the staining subcontractor's ability to stain textured concrete or sculpted shotcrete surfaces similar to the textured concrete or sculpted shotcrete 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

59-7.02A(3)(c) Installation Plan

Submit an installation plan at least 10 days before the preconstruction meeting. The installation plan must include details for preparing and staining the textured concrete or sculpted shotcrete to achieve the required color, 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. Methods and tools that will be used to apply the stain
3. Methods for protecting adjacent surfaces during staining
4. Rinse water collection plan for containing all liquid, effluent, and residue resulting from preparing and staining textured concrete or sculpted shotcrete

59-7.02A(4) Quality Control and Assurance

59-7.02A(4)(a) General

Reserved

59-7.02A(4)(b) Contractor Qualifications

The staining subcontractor must:

1. Have experience in staining textured concrete or sculpted shotcrete surfaces to simulate the appearance of natural rock formations or stone masonry
2. Have successfully completed at least 3 projects in the past 5 years involving staining of concrete or sculpted shotcrete surfaces similar to the textured concrete or sculpted shotcrete for this project

59-7.02A(4)(c) Preconstruction Meeting

Before starting staining activities, conduct a meeting to discuss the installation plan. Meeting attendees must include the Engineer and all staining subcontractors.

59-7.02B Materials

Not Used

59-7.02C Construction

Not Used

59-7.02D Payment

Prepare and stain concrete and prepare and stain shotcrete are measured by the area of the vertical or sloped wall face stained.

Replace "solider" in the 5th paragraph of section 59-9.03 with:

04-19-13

soldier

Replace section 59-11 with:

07-19-13

59-11 STAINING GALVANIZED SURFACES

Reserved

Replace section 59-12 with:

07-19-13

59-12 ROCK STAINING

59-12.01 GENERAL

59-12.01A Summary

Section 59-12 includes specifications for applying stain to the exterior surface of landscape boulders, native rock that has been damaged or scarred, rock energy dissipaters, rock slope protection and gabion surfaces.

59-12.01B Submittals

Submit the following:

1. Work plan showing methods to control overspray and spillage, and to protect adjacent surfaces
2. Product data including the manufacturer's product sheet and the instructions for the application of the stain

59-12.01C Quality Control and Assurance

59-12.01C(1) General

Reserved

59-12.01C(2) Test Plot

Apply the stain to a test plot rock area of at least 3 by 3 feet at a location designated by the Engineer. Notify the Engineer at least 7 days before staining the test plot. Prepare and stain the test plot with the same materials, tools, equipment, and methods to be used in staining the final surfaces. Separate test plots are required for staining rock slope protection and native rock.

If ordered, prepare additional test plots. Additional test plots are change order work.

Obtain authorization of the test plot before starting the staining work. Use the authorized test plot as the standard for comparison in determining acceptability of staining. If the test plot is not incorporated into the work and the Engineer determines it is no longer needed, dispose of it.

59-12.02 MATERIALS

59-12.02A General

Reserved

59-12.02B Stain

Reserved

59-12.03 CONSTRUCTION

59-12.03A General

Reserved

59-12.03B Preparation

Before applying the stain:

1. Identify and obtain authorization for the areas to be stained
2. Remove oils, dirt, and other contaminants from the surfaces to be stained
3. Dry all surfaces to be stained

59-12.03C Application

After the areas to be stained have been identified, prepared, and the test plot authorized, stain the exposed surfaces under the manufacturer's instructions to achieve a color consistent with, or as close as possible to, the authorized test area color.

Control overspray and protect adjacent surfaces.

Keep stained surfaces dry for at least 20 days following the application of the stain.

59-12.04 PAYMENT

Rock stain areas are measured along the slope face.

^^^

64 PLASTIC PIPE

07-19-13

Replace the 2nd paragraph of section 64-1.01A with:

10-19-12

Plastic pipe includes all necessary elbows, wyes, tees, other branches, fittings, coupling systems, concrete collars or tees, and reinforcement.

Replace item 1 in the list in the 3rd paragraph of section 64-1.02E with:

07-19-13

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.

^^

65 CONCRETE PIPE

07-19-13

Replace the 2nd paragraph of section 65-1.01 with:

10-19-12

Concrete pipe includes all necessary elbows, wyes, tees, other branches, concrete collars or tees, and reinforcement.

Replace section 65-2.02D with:

07-19-13

65-2.02D Reserved

^^

70 MISCELLANEOUS DRAINAGE FACILITIES

07-19-13

Replace section 70-5.02A(2) with:

01-20-12

70-5.02A(2) Plastic Flared End Sections

Plastic flared end sections must comply with ASTM D 3350.

Replace "40-1.03N" in item 2.4 of the 1st paragraph of section 70-5.06C with:

07-19-13

40-1.03K

Replace the 2nd, 3rd, and 4th paragraphs of section 70-7.02B with:

01-18-13

Before shipping, the exterior surfaces of the casing must be cleaned, primed, and coated to comply with ANSI/AWWA C213 or ANSI/AWWA C214.

Wrapping tape for repairing damaged coating and wrapping field joints and fittings must be a pressure-sensitive PVC or polyethylene tape with a minimum thickness of 50 mils, 2 inches wide.

Add to section 70-7.03:

01-18-13

Repair damaged coating on the casing and wrap field joints and fittings with wrapping tape as follows:

1. Before wrapping, thoroughly clean and prime the pipe casing, joints, and fittings under the tape manufacturer's instructions.
2. Wrap the tape tightly with 1/2 uniform lap, free from wrinkles and voids to provide not less than a 100-mil thickness.
3. Wrapping at joints must extend at least 6 inches over adjacent pipe casing coverings. Apply tension such that the tape will conform closely to contours of the joint.

Add to section 70:

07-19-13

70-8–70-15 RESERVED

^^^

07-19-13

Delete the 7th paragraph of section 72-11.01C(1).

Add between the 7th and 8th paragraphs of section 72-11.01C(1):

07-19-13

Schedule the construction of the slope paving such that the work, including placing and finishing concrete and applying curing compound, is completed on the same day that the work is started.

Replace the 8th paragraph of section 72-11.01C(1) with:

07-19-13

If the Engineer determines that the size of the slope paving is too large to be constructed without an intermediate construction joint, place a joint at an authorized location. Complete a section of concrete bounded by permissible construction joints within the same day.

Replace the 1st paragraph of section 72-11.01C(2) with:

01-18-13

Construct and finish minor concrete slope paving under section 51-1.

Replace the 3rd paragraph of section 72-11.01C(2) with:

07-19-13

After striking-off to grade, hand float the concrete with floats that are at least 4 inches wide and 30 inches long. Broom the entire surface with a stiff-bristled broom to produce a uniform surface. Brooming must be done when the surface is sufficiently set to prevent deep scarring and must be accomplished by drawing the broom down the slope, leaving marks parallel to the slope. The Engineer may order you to apply a fine spray of water to the surface immediately before brooming.

07-19-13

Delete the 3rd paragraph of section 72-11.01D.

^^

73 CONCRETE CURBS AND SIDEWALKS

07-19-13

Replace the paragraph in section 73-1.01A with:

07-19-13

Section 73-1 includes general specifications for constructing minor concrete items including concrete curbs, sidewalks, gutter depressions, driveways, island paving, and curb ramps; for installing detectable warning surfaces and precast parking bumpers; and for texturing and coloring concrete surfaces.

^^

74 PUMPING EQUIPMENT AND CONTROLS

04-19-13

Replace the 1st paragraph of section 74-1.01C(3) with:

04-19-13

Submit at least 5 copies of product data to OSD, Documents Unit. Each copy must be bound together and include an index stating equipment names, manufacturers, and model numbers. Two copies will be returned. Notify the Engineer of the submittal. Include in the notification the date and contents of the submittal.

Replace the 1st sentence of the 1st paragraph in section 74-2.01D(2) with:

01-20-12

Drainage pumps must be factory certified under ANSI/HI 14.6.

^^

75 MISCELLANEOUS METAL

07-19-13

Add between 2nd and 3rd paragraphs of section 75-1.03A:

07-19-13

Fabricate expansion joint armor from steel plates, angles, or other structural shapes. Shape the armor to the section of the concrete deck and match-mark it in the shop. Straighten warped sections of expansion joint armor before placing. Secure the expansion joint armor in the correct position during concrete placement.

Replace "SSPC-QP 3" in the 3rd paragraph of section 75-1.03E(4) with:

10-19-12

AISC-420-10/SSPC-QP3

Replace "metal beam guard railing" in the table in the 1st paragraph of section 75-1.05 with:

07-19-13

guardrail

^^

Replace section 78 with:

07-20-12

78 INCIDENTAL CONSTRUCTION

07-20-12

78-1 GENERAL

Section 78 includes specifications for incidental bid items that are not closely associated with other sections.

78-2–78-50 RESERVED

^^

80 FENCES

10-19-12

Add to section 80-2.02D:

10-19-12

Vertical stays must:

1. Comply with ASTM A641
2. Be 12-1/2 gage
3. Have a Class 3 zinc coating

Replace item 1 in the list in section 80-2.02E with:

10-19-12

Comply with ASTM A 116, Type Z, Grade 60, Class 1

Add after "galvanized wire" in the 1st paragraph of section 80-2.02F:

10-19-12

complying with ASTM A 641

Replace the 3rd and 4th paragraphs of section 80-2.02F with:

10-19-12

Each staple used to fasten barbed wire and wire mesh fabric to wood posts must:

1. Comply with ASTM F 1667
2. Be at least 1-3/4 inches long
3. Be manufactured from 9-gage galvanized wire

Wire ties used to fasten barbed wire and wire mesh to metal posts must be at least 11-gage galvanized wire complying with ASTM F 626. Clips and hog rings used for metal posts must be at least 9-gage galvanized wire complying with ASTM F 626.

Replace the 8th through 14th paragraphs of section 80-2.03 with:

10-19-12

Attach the wire mesh and barbed wire to each post.

Securely fasten tension wires to wood posts. Make a single or double loop around each post at each attachment point and staple the wire to the post. Use wire ties, hog rings, or wire clips to fasten the wires to the metal posts.

Connect each wood brace to its adjacent post with a 3/8 by 4-inch steel dowel. Twist the tension wires until the installation is rigid.

Stretch barbed wire and wire mesh fabric and fasten to each wood or steel end, corner, or gate post. Apply tension according to the manufacturer’s instructions using a mechanical stretcher or other device designed for such use. If no tension is specified by the manufacturer, use 250 pounds for the required tension. Evenly distribute the pull over the longitudinal wires in the wire mesh such that no more than 50 percent of the original depth of the tension curves is removed. Do not use a motorized vehicle, truck, or tractor to stretch the wire.

Attach barbed wire and wire mesh fabric to the private-property side of posts. On curved alignments, place the wire mesh and barbed wire on the face of the post against which the normal pull of the wire mesh and wire will be exerted. Terminate the wire mesh and barbed wire at each end, corner, pull, and gate post in the new fence line. Attach wire mesh and barbed wire to each wood or steel end, corner, pull,

or gate post by wrapping each horizontal strand around the post and tying it back on itself with at least 4 tightly-wound wraps.

At line posts, fasten the wire mesh to the post at the top and bottom and at intermediate points not exceeding 10 inches apart. Fasten each line of barbed wire to each line post. Use wire ties or clips to fasten the wires to metal posts under the post manufacturer’s instructions. Drive staples crosswise with the grain of the wood and pointed slightly downward. Drive staples just short of actual contact with the wires to allow free longitudinal movement of those wires and to prevent damage to the wire’s protective coating. Secure all wires to posts to maintain horizontal alignment.

Splices in barbed wire and wire mesh are allowed provided there are no more than 2 splices per 50 feet of fence. Use commercially-available galvanized mechanical wire splices or a wire splice created by tying off wire. Install mechanical wire splices with a tool designed for that purpose under the manufacturer's instructions. Tie off the wire as follows:

1. Carry the ends of each wire 3 inches past the tied-off knot location and wrap around the wire for at least 6 turns in opposite directions.
2. Remove the splice tool and close the space by pulling the end of the wires together.
3. Cut the unused ends of the wire close and neat.

Add to "≤ 6" in the table in the 4th paragraph of section 80-3.02B:

10-19-12

feet

^^^

Replace "Metal rail posts, box spacers, and" in item 1 in the list in the 25th paragraph of section 83-1.02B with:

07-19-13

Metal box spacers and

07-19-13

Delete items 6 and 7 in the list in the 25th paragraph of section 83-1.02B.

Replace "Type WB" at each occurrence in section 83-1.02B(2) with:

07-19-13

Type WB-31

Replace the heading of section 83-1.02B(3) with:

07-19-13

Temporary Midwest Guardrail System

Replace "80-2.02" in the 2nd paragraph of section 83-1.02E with:

10-19-12

80-3.02B

Replace "sets" in the 10th paragraph of section 83-1.02G(2) with:

07-19-13

copies

Add to section 83-2.02D(1):

10-21-11

For a concrete barrier transition:

1. Remove portions of the existing concrete barrier where shown under section 15-3
2. Roughen the contact surface of the existing concrete barrier
3. Drill and bond dowels into the existing concrete barrier under section 51-1

Add to section 83-2.02:

10-19-12

83-2.02H–83-2.02M Reserved

^^

84 TRAFFIC STRIPES AND PAVEMENT MARKINGS

01-20-12

Replace the 1st paragraph in section 84-2.04 with:

01-20-12

A double extruded thermoplastic traffic stripe consisting of two 4-inch wide yellow stripes is measured as 2 traffic stripes.

A double sprayable thermoplastic traffic stripe consisting of two 4-inch wide yellow stripes is measured as 1 traffic stripe.

Add to section 84:

01-20-12

84-6 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS WITH ENHANCED WET NIGHT VISIBILITY

Reserved

84-7–84-10 RESERVED

^^

86 ELECTRICAL SYSTEMS

07-19-13

Replace the paragraphs in section 86-1.01 with:

07-19-13

Section 86 includes general specifications for constructing and rehabilitating electrical systems.

Electrical systems must comply with the material and installation specifications in section 86-2.

Section 86-3 includes specifications for constructing controller assemblies.

Section 86-4 includes specifications for constructing traffic signal faces, programmed visibility signal faces, pedestrian signal faces, flashing beacons, ramp metering signs, and signal mounting assemblies.

Section 86-5 includes specifications for constructing vehicle detectors and pedestrian push button assemblies.

Section 86-6 includes specifications for constructing lighting systems.

Section 86-7 includes specifications for constructing rehabilitating electrical equipment.

Comply with Part 4 of the *California MUTCD*. Nothing in section 86 is to be construed as to reduce the minimum standards in this manual.

The locations shown for electrical systems are approximate; the Engineer determines the final locations.

Replace the paragraphs in section 86-1.015 with:

07-19-13

actuation: Actuation as defined in the *California MUTCD*.

channel: Discrete information path.

controller assembly: Assembly for controlling a system's operations, consisting of a controller unit and auxiliary equipment housed in a rainproof cabinet.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

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.

flashing beacon control assembly: Assembly of switches, circuit breakers, terminal blocks, flasher, wiring, and other necessary electrical components housed in a single enclosure for operating a beacon.

inductive loop detector: Detector capable of being actuated by an inductance change caused by a vehicle passing or standing over the loop.

lighting standard: Pole and mast arm supporting the luminaire.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

magnetic detector: Detector capable of being actuated by an induced voltage caused by a vehicle passing through the earth's magnetic field.

powder coating: Coating applied electrostatically using exterior-grade UV-stable polymer powder.

pretimed controller assembly: Assembly operating traffic signals under a predetermined cycle length.

pull box: A box with a cover that is installed in an accessible place in a run of conduit to facilitate the pulling in of wires or cables.

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 and mast arm supporting 1 or more signal faces with or without a luminaire mast arm.

traffic-actuated controller assembly: Assembly for operating traffic signals under the varying demands of traffic as registered by detector actuation.

traffic phase: Signal phase as defined in the *California MUTCD*.

vehicle: Vehicle as defined in the *California Vehicle Code*.

Replace the paragraphs in section 86-1.02 with:

07-19-13

Comply with 8 CA Code of Regs § 2299 et seq.

Electrical equipment must comply with one or more of the following standards:

1. ANSI
2. ASTM
3. EIA
4. NEMA
5. NETA
6. UL
7. Public Utilities Commission, General Order No. 95, "Rules for Overhead Electrical Sign Construction"
8. Public Utilities Commission, General Order No. 128, "Rules for Construction of Underground Electric Supply and Communication Systems"

Materials and workmanship must comply with:

1. FCC rules
2. ITE standards
3. NEC
4. California Electrical Code

Electrical equipment and materials must be NRTL certified wherever applicable.

Replace the paragraphs in section 86-1.03 with:

07-19-13

Submit a schedule of values within 15 days after Contract approval.

Determine the quantities required to complete the work. Submit the quantities as part of the schedule of values.

Provide a schedule of values for each lump sum bid item.

Do not include costs for the traffic control system in the schedule of values.

The schedule of values must include the type, size, and installation method for:

1. Foundations
2. Standards and poles
3. Conduit
4. Pull boxes
5. Conductors and cables
6. Service equipment enclosures
7. Telephone demarcation cabinets
8. Vehicle signal heads and hardware
9. Pedestrian signal heads and hardware
10. Push buttons
11. Loop detectors
12. Luminaires and lighting fixtures
13. Materials shown in the quantity tables on plan sheets labeled *E*

Replace the paragraphs in section 86-1.04 with:

07-19-13

Within 15 days of Contract approval, submit a list of equipment and materials that you propose to install. Submit the list before shipping equipment or materials to the job site. The list must include the following information:

1. Manufacturer's name
2. Make and model number
3. Month and year of manufacture
4. Lot and serial numbers
5. Dimensions
6. List of components
7. Manufacturer's installation instructions
8. Contract number
9. Your contact information

Supplement the list with 2 copies of the following data:

1. Schematic wiring diagrams
2. Scale drawings of cabinets showing location and spacing of shelves, terminal blocks, and equipment, including dimensions
3. Operation manual

Electrical equipment constructed as shown does not require detailed drawings and diagrams.

Submit 3 sets of computer-generated schematic wiring diagrams for the cabinet.

Place the schematic wiring diagram in a heavy-duty plastic envelope and attach it to the inside of the cabinet door.

Prepare diagrams, plans, and drawings using graphic symbols in IEEE 315, "Graphic Symbols for Electrical and Electronic Diagrams."

Replace the 5th paragraph of section 86-2.04B(2) with:

07-19-13

HS bolts, nuts, and flat washers used to connect slip base plates must comply with the requirements for HS fastener assemblies for use in structural steel joints in section 55-1.02A(1) except rotational capacity testing and tension testing are not required.

07-19-13

Delete the row for standard Type 36-20A in the table in the 6th paragraph of section 86-2.04B(2).

Replace the 10th paragraph of section 86-2.04B(2) with:

07-19-13

Bolted connections attaching signal or luminaire arm to the pole must be considered slip critical. Galvanized faying surfaces of plates on luminaire arm, signal arm, and pole must be roughened by hand using a wire brush before assembly and must comply with requirements for Class C surface conditions for slip-critical connections in *Specification for Structural Joints Using High-Strength Bolts* of the RCSC. Coatings for faying surfaces must comply with the RCSC specification for Class B coatings.

Replace the 1st sentence of item 8 in the list in the 1st paragraph of section 86-2.04B(3) with:

07-19-13

During manufacturing, longitudinal seams on vertical tubular members of cantilevered support structures must be within 90 degrees circumferentially of the center of the longest mast arm connection.

07-19-13

Delete item 15.3 in the list in the 1st paragraph of section 86-2.04B(3).

Add between "Exposed" and "conduit" in the 2nd paragraph of section 86-2.05B:

07-19-13

Type 1

Replace the 1st sentence of the 10th paragraph of section 86-2.05C with:

07-19-13

After installing conduit, install the pull tape.

Replace the 1st and 2nd sentences of the 2nd paragraph of section 86-2.05D with:

07-19-13

Install an expansion-deflection fitting for expansion joints with a 1-1/2-inch movement rating. The fitting must be watertight and include a molded neoprene sleeve, a bonding jumper, and 2 silicon bronze or zinc-plated iron hubs.

Replace section 86-2.06 with:

07-19-13

86-2.06 PULL BOXES

86-2.06A General

86-2.06A(1) Cover Marking

The cover marking must be clearly defined, uniform in depth, and parallel to either the long or short sides of the cover.

Marking letters must be 1 to 3 inches high.

Before galvanizing steel or cast iron cover, apply marking by one of the following methods:

1. Use cast iron strip at least 1/4 inch thick with letters raised a minimum of 1/16 inch. Fasten strip to cover with 1/4-inch flathead stainless steel machine bolts and nuts. Peen bolts after tightening.
2. Use sheet steel strip at least 0.027 inch thick with letters raised a minimum of 1/16 inch. Fasten strip to cover by spot welding, tack welding, or brazing, with 1/4-inch stainless steel rivets or 1/4-inch roundhead stainless steel machine bolts and nuts. Peen bolts after tightening.
3. Bead weld the letters on cover such that the letters are raised a minimum of 3/32 inch.

86-2.06A(2) Installation and Use

Space pull boxes no more than 200 feet apart. You may install additional pull boxes to facilitate the work.

You may use a larger standard size pull box than that shown on the plans or specified.

A pull box in ground or sidewalk area must be installed as follows:

1. Embed bottom of the pull box in crushed rock.
2. Place a layer of roofing paper on the crushed rock.
3. Place grout over the layer of roofing paper. Grout must be 0.50 to 1 inch thick and sloped toward the drain hole.
4. Make a 1-inch drain hole in the center of the pull box through the grout and roofing paper.
5. Place grout between the pull box and the pull box extension, and around conduits.

The top of the pull box must be flush with the surrounding grade or the top of an adjacent curb, except in unpaved areas where the pull box is not immediately adjacent to and protected by a concrete foundation, pole, or other protective construction. Place the pull box 1-1/4 inches above the surrounding grade. Where practical, place a pull box shown in the vicinity of curbs or adjacent to a standard on the side of the foundation facing away from traffic. If a pull box is installed in a sidewalk area, adjust the depth of the pull box so that the top of the pull box is flush with the sidewalk.

Reconstruct the sump of an existing pull box if disturbed by your activities. Remove old grout and replace with new if the sump was grouted.

86-2.06B Non–Traffic Pull Boxes

Reserved

86-2.06C Traffic Pull Boxes

The traffic pull box and cover must comply with ASTM C857, "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures," for HS20 loading. You must be able to place the load anywhere on the box and cover for 1 minute without causing cracks or permanent deformations.

Frame must be anchored to the box with 1/4 by 2-1/4 inch concrete anchors. Four concrete anchors must be included for No. 3-1/2(T) pull box; one placed in each corner. Six concrete anchors must be included for No. 5(T) and No. 6(T) pull boxes; one placed in each corner and one near the middle of each of the longer sides.

Nuts must be zinc-plated carbon steel, vibration resistant, and have a wedge ramp at the root of the thread.

After installation of traffic pull box, install the steel cover and keep it bolted down when your activities are not in progress at the pull box. When the steel cover is placed for the final time, the cover and Z bar frame must be cleaned of debris and tightened securely.

Steel cover must be countersunk approximately 1/4 inch to accommodate the bolt head. When tightened, the bolt head must not exceed more than 1/8 inch above the top of the cover.

Concrete placed around and under traffic pull boxes must be minor concrete.

Replace the 11th row in the table in the 1st paragraph of section 86-2.08B with:

07-19-13

Grounded circuit conductor	Pedestrian push buttons	Wht	Blk	NBR	14
	Signals and multiple lighting	Wht	None	NBR	10
	Flashing beacons and sign lighting	Wht	None	NBR	12
	Lighting control	Wht	None	C-3	14
	Service	Wht	None	NBR	14

Replace the 1st sentence of the 1st paragraph of section 86-2.08C with:

07-19-13

Circuit conductors, connectors, and terminals must be UL or NRTL listed and rated for 600 V(ac) operation.

Add to the beginning of section 86-2.09A:

07-19-13

Provide enough traffic signal light conductors for functional operation of the signal. Provide 3 spare conductors in all conduits containing traffic signal light conductors.

Replace the paragraphs in section 86-2.09C with:

07-19-13

Connectors must be crimp type. Use a manufacturer-recommended tool for connectors and terminals to join conductors. Comply with SAE-AS7928.

Terminate stranded conductors smaller than no. 14 in crimp style terminal lugs.

Terminate field conductors no. 12 and smaller with spade type terminals. Terminate field conductors no. 10 and larger with spade type or ring type terminals.

Replace the value for resistivity in the table in the 6th paragraph of section 86-2.09E with:

07-19-13

25×10^{13} Ω per inch, minimum

Add between "the" and "head" in the 3rd sentence of the 2nd paragraph of 86-2.09F:

07-19-13

connector

Replace "project" in the 3rd paragraph of section 86-2.11A with:

10-19-12

work

Replace "Contract" in item 2 in the list in the 11th paragraph of section 86-2.11A with:

10-19-12

work

07-19-13

Delete the 12th paragraph of section 86-2.11A.

Replace section 86-2.11C with:

07-19-13

86-2.11C Electrical Service for Booster Pumps

Provide electrical service from the service point to the booster pump.

Furnish conductors, conduit, and pull boxes from the service point to the booster pump.

Do not use Type 3 conduit unless shown otherwise.

Replace section 86-2.14A with:

07-19-13

86-2.14A General

Deliver material and equipment for acceptance testing to either METS or a testing location as ordered.

Allow 30 days for testing. The Department notifies you when testing is complete. You must pick up the material or equipment from the test site and deliver it to the job site.

If material or equipment is rejected, allow 30 days for retesting. The retesting period starts when replacement material or equipment is delivered to the test site.

If material or equipment submitted for testing does not comply with the specifications, remove it within 5 business days after you are notified that the equipment is rejected. If equipment is not removed within that period, the Department may ship it to you and deduct the shipping cost.

Testing and quality control procedures for traffic signal controller assemblies must comply with NEMA TS standards for traffic control systems.

Replace the 2nd paragraph of section 86-3.02A(1) with:

07-19-13

The Department furnishes the BBS components under section 6-2.03.

Replace the 9th paragraph of section 86-3.02B with:

07-19-13

The couplings between the external cabinet and Model 332L cabinet must include a conduit for power connections between the 2 cabinets. Couplings must include:

1. 2-inch nylon-insulated steel chase nipple
2. 2-inch sealing steel locknut
3. 2-inch nylon-insulated steel bushing

07-19-13

Delete item 1.3 in the list in the 7th paragraph of section 86-3.04A.

Replace the 2nd paragraph of section 86-4.01A with:

07-19-13

The housing must not fail structurally as described in the following table:

Housing Structural Failure

Housing type	Test method	Description of structural failure
Metal	California Test 666	Fracture within the housing assembly or deflection of more than half the lens diameter of the signal section during the wind load test
Plastic	California Test 605	Fracture within the housing assembly or deflection of more than 10 degrees in either the vertical or horizontal plane after the wind load has been removed from the front of the signal face or deflection of more than 6 degrees in either the vertical or horizontal plane after the wind load has been removed from the back of the signal face

Replace the 1st sentence of section 86-4.01A(1) with:

07-19-13

Each metal housing must have a metal visor.

Replace the 1st sentence of section 86-4.01A(2) with:

07-19-13

Each plastic housing must be molded in 1 piece or fabricated from 2 or more pieces and joined into a single piece.

07-19-13

Delete item 1 in the list in section 86-4.01D(1)(b).

Replace the paragraphs in section 86-4.01D(1)(c)(i) with:

07-19-13

LED signal modules must be on the Authorized Material List for LED traffic signals.

The Department tests modules under section 86-2.14A, ANSI/ASQ Z1.4, and:

1. California Test 604 for LED and circular LED signal modules
2. California Test 3001 for arrow, U-turn, and bicycle LED signal modules

The LED signal modules submitted for testing must be typical production units. LEDs must be spread evenly across the module.

The Department may test the modules on all parameters specified in section 86-4.01D.

Replace the 1st and 2nd sentences of the 3rd paragraph of 86-4.01D(2)(b) with:

07-19-13

The electrical connection for each flashing LED signal module must be 4 secured, color-coded, jacketed copper wires. The wire must comply with the NEC.

Replace the heading of section 86-4.02 with:

07-19-13

PROGRAMMED VISIBILITY VEHICLE SIGNAL SECTION

Replace "face" in the 1st paragraph of section 86-4.02 with:

07-19-13

section

Add before the 1st sentence in section 86-4.03A:

07-19-13

The pedestrian signal face must be Type A.

Replace the 1st sentence of the 2nd paragraph of section 86-4.03B with:

07-19-13

The Department tests the pedestrian signal's front screen in a horizontal position with its edges supported.

07-19-13

Delete items 1 and 4 in the list in section 86-4.03I(1)(b).

Replace the paragraphs of section 86-4.03I(1)(c)(i) with:

07-19-13

The LED PSF module must be on the Authorized Material List for LED traffic signals.

The Department tests LED PSF modules under section 86-2.14A, ANSI/ASQ Z1.4, and California Test 606.

The LED PSF modules submitted for testing must be representative of typical production units.

The Department may test the modules on all parameters specified in section 86-4.03I.

Replace item 1 in the list in the 1st paragraph of section 86-4.03I(2) with:

07-19-13

1. Not include reflectors.

Replace item 6 in the list in the 1st paragraph of section 86-4.03I(2) with:

07-19-13

6. Be able to replace signal lamp optical units and pedestrian signal faces with LEDs.

Replace the table titled "Chromaticity Standards (CIE Chart)" in the 16th paragraph of section 86-4.03I(2) with:

07-19-13

Chromaticity Standards (CIE Chart)

Upraised hand	X: not greater than 0.659 or less than 0.600 Y: not greater than 0.390 or less than 0.331 Y= 0.990-X
Walking person	X: not greater than 0.440 or less than 0.280 Y: not greater than 0.0483 + 0.7917(X) or less than 0.0983 + 0.7917(X)

Add between "beacon" and "must" in the 1st sentence of section 86-4.05:

07-19-13

signal face

07-19-13

Delete "face" in item 1 in the list in the 1st paragraph of section 86-4.05.

Replace the row for viscosity in the table in the 2nd paragraph of section 86-5.01A(3)(c) with:

07-19-13

Viscosity, Brookfield Thermosel, no. 27 Spindle, 20 rpm, 190 °C	D 4402	2.5–3.5 Pa·s

Replace the paragraph in section 86-5.01A(3)(d) with:

07-19-13

Use epoxy sealant for repair work in and around sawcuts housing inductive loops.

Replace "all loop conductors" in the 3rd paragraph of section 86-5.01A(4) with:

07-19-13

the detector lead-in cable

Replace "Encase the loop wires" in the 1st sentence of the 3rd paragraph of section 86-5.01A(5) with:

07-19-13

The loop wires must be encased

Replace section 86-5.02 with:

07-19-13

86-5.02 PUSH BUTTON ASSEMBLIES

The housing for a push button assembly must be die-cast or permanent mold-cast aluminum. The assembly must be rainproof and shockproof in any weather condition.

The push button's switch must be a single-pole, double-throw switching unit with screw-type terminals rated 15 A at 125 V(ac). The switch must have:

1. Plunger actuator and a U frame to allow recessed mounting in the push button housing

2. Operating force of 3.5 lb
3. Maximum pretravel of 5/64 inch
4. Minimum overtravel of 1/32 inch
5. Differential travel from 0.002 to 0.04 inch
6. 2-inch minimum diameter actuator

Where a push button is attached to a pole, the housing must be shaped to fit the pole's curvature. Use saddles if needed to make a neat and secure fit.

Where a push button is mounted on top of a 2-1/2-inch-diameter post, fit the housing with a slip fitter and use screws to rigidly secure it to the post.

Install the push button and the sign on the crosswalk side of the pole.

Attach the sign on a Type B push button assembly.

For a Type C push button assembly, mount the instruction sign on the same standard as the assembly using 2 straps and saddle brackets.

Add to section 86-5:

07-19-13

86-5.03 ACCESSIBLE PEDESTRIAN SIGNAL

Reserved

Replace "lthe amp" in item 2 in the list in the 1st paragraph of section 86-6.01A(2) with:

07-19-13

the lamp

^^^

Replace the row for hydraulic bursting strength in the table in the 2nd paragraph of section 88-1.02B with:

10-19-12

Puncture strength, lb min	ASTM D 6241	310
Trapezoid tearing strength, lb min	ASTM D 4533	56

Replace the 3rd paragraph in section 88-1.02C with:

10-19-12

Geocomposite wall drain must be from 0.25 to 2 inches thick.

Replace the value for permittivity of woven fabric in the table in the 1st paragraph of section 88-1.02E with:

01-20-12

0.05

Replace the value for apparent size opening of nonwoven fabric in the table in the 1st paragraph of section 88-1.02E with:

01-20-12

0.012

Replace the table in the 1st paragraph of section 88-1.02G with:

01-20-12

Sediment Filter Bag

Property	Test	Values	
		Woven	Nonwoven
Grab breaking load, lb, 1-inch grip min, in each direction	ASTM D 4632	200	250
Apparent elongation, percent min, in each direction	ASTM D 4632	10	50
Water flow rate, gal per minute/sq ft min and max average roll value	ASTM D 4491	100-200	75-200
Permittivity, sec^{-1} min	ASTM D 4491	1.0	1.0
Apparent opening size, inches max average roll value	ASTM D 4751	0.023	0.012
Ultraviolet resistance, % min retained grab breaking load, 500 hr.	ASTM D 4355	70	70

Replace the table in the 1st paragraph of section 88-1.02H with:

01-20-12

Temporary Cover

Property	Test	Values	
		Woven	Nonwoven
Grab breaking load, lb, 1-inch grip min, in each direction	ASTM D 4632	200	200
Apparent elongation, percent min, in each direction	ASTM D 4632	15	50
Water flow rate, gal per minute/sq ft min and max average roll value	ASTM D 4491	4-10	80-120
Permittivity, sec^{-1} min	ASTM D 4491	0.05	1.0
Apparent opening size, inches max average roll value	ASTM D 4751	0.023	0.012
Ultraviolet resistance, % min retained grab breaking load, 500 hr.	ASTM D 4355	70	70

Replace section 88-1.02P with:

01-18-13

88-1.02P Biaxial Geogrid

Geosynthetics used for biaxial geogrid must be a punched and drawn polypropylene material formed into an integrally formed biaxial grid. When tested under the referenced test methods, properties of biaxial geogrid must have the values shown in the following table:

Biaxial Geogrid

Property	Test	Value
Aperture size, inch[a] min and max	Calipered	0.8-1.3 x 1.0-1.6
Rib thickness, inch min	Calipered	0.04
Junction thickness, inch min	Calipered	0.150
Tensile strength, 2% strain, lb/ft[a] min	ASTM D 6637	410 x 620
Tensile strength at ultimate, lb/ft[a] min	ASTM D 6637	1,310 x 1,970
Ultraviolet resistance, percent min retained tensile strength, 500 hours	ASTM D 4355	100
Junction strength, lb/ft[a] min	ASTM D 7737	1,220 x 1,830
Overall flexural rigidity, mg-cm min	ASTM D 7748	750,000
Torsional rigidity at 20 cm-kg, mm-kg/deg[b] min	GRI:GG9	0.65

[a]Machine direction x cross direction

[b]Geosynthetic Research Institute, Test Method GG9, *Torsional Behavior of Bidirectional Geogrids When Subjected to In-Plane Rotation*

Replace section 88-1.02Q with:

07-19-13

88-1.02Q Geosynthetic Bond Breaker

Geosynthetic bond breaker must be nonwoven; needle punched; not heat treated; polypropylene, polyethylene material.

When tested under the referenced test methods, properties of geosynthetic bond breaker material must have the values shown in the following table:

Geosynthetic Bond Breaker

Property	Test	Value
Mass per unit area, oz/sq yd min	ASTM D 5261	14.7
Thickness at 29 psi, mm min	ASTM D 5199	1.0
Tensile strength at ultimate, lbs/ft min	ASTM D 4595	685
Elongation, percent max	ASTM D 4595	130
Permittivity at 2.9 psi, m/s min	ASTM D 5493	0.0001
Hydraulic transmissivity at 29 psi, m/s min	ASTM D 6574	0.0002
Ultraviolet resistance, percent min retained grab breaking load, 500 hours	ASTM D 4355	60

^^

90 CONCRETE

07-19-13

Replace the 3rd paragraph of section 90-1.01C(7) with:

08-05-11

Submit weighmaster certificates in printed form or, if authorized, in electronic media. Present electronic media in a tab-delimited format on a CD or DVD. Captured data for the ingredients represented by each batch must be line feed carriage return and one line separate record with sufficient fields for the specified data.

Replace the 3rd paragraph of section 90-3.01C(5) with:

08-05-11

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

Replace the 1st paragraph of section 90-4.01A with:

07-19-13

Section 90-4 includes specifications for fabricating PC concrete members.

Replace the paragraphs in section 90-4.01C with:

07-19-13

90-4.01C(1) General

For reports and logs, type or clearly print the name next to the signature of the person signing the report or log.

Submit expansion test data under section 90-4.02, if required.

90-4.01C(2) Certificates of Compliance

Submit a certificate of compliance for the cementitious material used in PC concrete members. The certificate must be signed by the PC concrete product manufacturer.

Submit a certificate of compliance for each PC concrete member. The certificate of compliance for tier 1 and tier 2 members must be signed by the QC manager. The certificate of compliance for tier 3 members must be signed by the QC Inspector.

90-4.01C(3) Precast Concrete Quality Control Plan

Before performing any precasting activities for tier 1 and tier 2 PC concrete members, submit 3 copies of the project-specific QC plan for the PC plant. The QC plan must supplement the information from the authorized facility audit. Submit a separate QC plan for each plant. Allow 25 days for review.

Each project-specific QC plan must include:

1. Name of the precasting plant, concrete plants, and any testing laboratory to be used.
2. Manual prepared by the precasting plant that includes:
   - 2.1. Equipment description
   - 2.2. Testing procedures
   - 2.3. Safety plan
   - 2.4. Personnel names, qualifications, and copies of certifications
3. QC manager and QC inspector names, qualifications, and copies of certifications.
4. Organizational chart showing QC personnel and their assigned QC responsibilities.
5. Methods and frequencies for performing QC procedures including inspections, material testing, and any survey performed for all components of PC concrete members. Components include prestressing, concrete, grout, reinforcement, steel, miscellaneous metal, and formwork.
6. System for reporting noncompliant PC concrete members to the Engineer.
7. System for identification and tracking repairs and repair methods.
8. Procedure for the reinspection of repaired PC concrete members.
9. Forms for certificates of compliance, daily production logs, and daily reports.

Submit a revised QC plan for any changes to:

1. Concrete plants
2. Material sources
3. Material testing procedures
4. Testing laboratory
5. Procedures and equipment
6. Updated systems for tracking and identifying PC concrete members
7. QC personnel

After authorization, submit 7 copies of each authorized QC plan and make 1 copy available at each location where work is performed.

Allow 7 days for review of a revised QC plan.

90-4.01C(4) Daily Production Log

The QC inspector must provide reports to the QC manager for each day that precasting activities are performed.

The QC manager must maintain a daily production log of PC activities for each day's precasting. PC activities include setting forms, placing reinforcement, setting prestressing steel, casting, curing, post

tensioning, and form release. This daily log must be available at the precasting plant. The daily log must include:

1. Plant location
2. Specific description of casting or related activities
3. Any problems or deficiencies discovered
4. Any testing or repair work performed
5. Names of QC inspectors and the specific QC inspections they performed that day
6. Reports for that day's precasting activities from each QC inspector including before, during, and after precast inspections

Immediately notify the Engineer when any precasting problems or deficiencies are discovered, and submit the proposed repair or process changes necessary to correct them.

90-4.01C(5) Precast Concrete Report

Before shipping PC concrete members, submit a PC concrete report. The report must include:

1. Reports of all material tests and any survey checks
2. Documentation that:
   2.1. You have evaluated all tests
   2.2. You corrected all rejected deficiencies
   2.3. Repairs have been reexamined with the required tests and found acceptable
3. Daily production logs
4. Certificates of compliance
5. Documentation of inspections

Each person who performs a material test or survey check must sign the corresponding report and submit the report directly to the QC manager.

Replace the paragraphs in section 90-4.01D with:

07-19-13

90-4.01D(1) General

Quality control and assurance for PC concrete includes:

1. Your QC program
2. Department's acceptance of PC concrete members

PC concrete members are categorized into the following 4 tiers:

1. Tier 1 consists of:
   1.1. Components of bridge structures, including girders, deck panels, bent caps, abutments, slabs, closure wall panels, and piling
   1.2. Prestressed pavement
2. Tier 2 consists of:
   2.1. Components of earth retaining systems
   2.2. Wingwalls
   2.3. Types A, B, and C pipe culvert headwalls, endwalls, and wingwalls
   2.4. Pavement
   2.5. Box culverts
   2.6. Sound wall panels and supports
3. Tier 3 consists of:
   3.1. Pipes
   3.2. Pipe drainage facilities
   3.3. Straight and "L" pipe culvert headwalls except those listed under tier 2
   3.4. Drainage Inlets
   3.5. Flared end sections
4. Tier 4 consists of any member not described as tier 1, tier 2, or tier 3

90-4.01D(2) Quality Control

90-4.01D(2)(a) General

For tier 1 and tier 2 PC concrete members:

1. Fabricate PC concrete members at a plant on the Authorized Facility Audit List
2. Assign a PC concrete QC manager to the plant
3. Assign a QC inspector who is either registered as a civil engineer in the State or:
   - 3.1. For tier 1, has a Plant Quality Personnel Level II certification from the Precast/Prestressed Concrete Institute
   - 3.2. For tier 2, has a Plant Quality Personnel Level I certification from the Precast/Prestressed Concrete Institute
4. Prepare a PC concrete QC plan
5. Perform PC concrete materials testing
6. Maintain a daily production log
7. Prepare a PC concrete report
8. Prepare a certificate of compliance

For tier 3 PC concrete members:

1. Assign a QC inspector who has one of the following qualifications:
   - 1.1. Registration as a civil engineer in the State.
   - 1.2. Plant Quality Personnel, Level I certification from the Precast/Prestressed Concrete Institute.
   - 1.3. Competency to perform inspection of PC operations. An inspector is competent if the individual has completed training or has experience in PC operations and inspection.
2. Prepare a certificate of compliance

For tier 4 PC concrete members, prepare a certificate of compliance.

For each ASTM test method specified in this section, the material's test result must comply with the requirement specified for the comparable test in section 90 unless otherwise specified.

If curing compound is used, provide certificate of compliance as specified in section 90-1.01C(5).

If PC concrete is manufactured at an established PC concrete plant, a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures under section 90-1.01D(5)(b) are not required.

90-4.01D(2)(b) Quality Control Meeting

After submitting the PC concrete QC plan, hold a meeting to discuss the requirements for PC concrete QC. The meeting attendees must include the Engineer, the PC concrete QC manager, and a representative from each plant performing PC concrete activities for the Contract.

90-4.01D(2)(c) Sampling, Testing, and Inspecting

The QC laboratory testing personnel or the QC inspector must witness sampling. The QC laboratory testing personnel must perform testing.

QC laboratory testing personnel must have the following certifications, as applicable:

1. ACI Strength Testing Technician
2. ACI Concrete Laboratory Testing Technician Level 1
3. ACI Aggregate Testing Technician Level 2

The QC Inspector must perform inspections before, during, and after casting is complete.

QC field testing and inspection personnel must have an ACI Concrete Field Testing Technician, Grade I certification.

For each mix design used for tier 1 and tier 2 PC concrete members, perform sampling and testing at the minimum frequencies shown in the following tables:

Aggregate QC Tests

Property	Test method	Minimum testing frequency
Aggregate gradation	ASTM C136	Once per 400 cu yd of concrete cast or once a week, whichever is more frequent
Sand equivalent	ASTM D2419	
Percent fines under 75 microns[a]	ASTM C117	
Moisture content of fine aggregate	ASTM C566, or electronically actuated moisture meter[b]	1–2 times per each day of pour, depending on conditions

[a]Percent fines under 75 microns test replaces the cleanness test in section 90-1.02C with the requirements of 1.5 percent maximum for "Operating Range" and 2.0 percent maximum for "Contract Compliance." The 5th paragraph of section 90-1.02C(2) does not apply.
[b]Electronically actuated moisture meter must be calibrated once per week per ASTM C566.

Concrete QC Tests

Property	Test method	Minimum testing frequency
Compressive strengthb	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	ASTM C1064/C1064M	
Density	ASTM C138	Once per 600 cu yd of concrete cast or each week 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

[a]ASTM C173/C173M must be used for lightweight concrete.
[b]Cylinders must be 6 by 12 inches.

If concrete is batched at more than 1 plant, perform the tests at each plant.

Cure test cylinders for determining time of prestressing loading in the same manner as the concrete in the member.

Cure test cylinders for determining compliance with 28-day strength requirements in the same manner as the member until completion of the steam curing process followed by a water bath or moist room at 60 to 80 degrees F until tested.

For PC concrete that is steam cured, concrete designated by compressive strength is acceptable if its compressive strength reaches the described 28-day compressive strength in no more than the maximum number of days specified or allowed after the concrete is cast.

90-4.01D(3) Quality Assurance

For PC concrete that is steam cured, the Engineer evaluates the compressive strength based on individual tests representing specific portions of production.

Add between the 1st and 2nd paragraphs of section 90-4.02:

07-19-13

PC portland cement based repair material must be on the Authorized Material List.

If municipally supplied potable water is used for PC concrete, the testing specified in section 90-1.02D is waived unless requested.

Add to section 90-4.03:

07-19-13

For dimensional tolerances of PC concrete members, comply with the Precast/Prestressed Concrete Institute Concrete Institute's *Tolerance Manual for Precast and Prestressed Concrete Construction, MNL 135-00*.

For tier 1 and tier 2 PC concrete members, apply curing compound using power-operated spraying equipment. You may request application by hand spraying for small quantities of PC concrete members. For tier 3 and tier 4 PC concrete members, the application of curing compound may be hand sprayed.

Replace the item 2 in the list in the 2nd paragraph of section 90-4.03 with:

07-19-13

2. To prevent moisture loss on the exposed surfaces during the presteaming period, cover the concrete as soon as possible after casting or keep the exposed surfaces wet by fog spray, curing compound, or wet blankets.

^^

91 PAINT

10-19-12

Add to section 91-2:

10-19-12

91-2.03 MOISTURE-CURED POLYURETHANE COATING

Reserved

Replace "saint" in the 1st paragraph of section 91-4.05 with:

10-19-12

paint

^^

92 ASPHALTS

07-19-13

Replace "Reserved" in section 92-1.01B with:

07-19-13

modified asphalt binder: Asphalt binder modified with polymers, crumb rubber, or both.

Replace the row for dynamic shear for original binder in the table in the 1st paragraph of section 92-1.02B with:

01-20-12

Dynamic shear,						
Test temperature at 10 rad/s, °C	T 315	58	64	64	64	70
min G*/sin(delta), kPa		1.00	1.00	1.00	1.00	1.00
max G*/sin(delta), kPa		2.00	2.00	2.00	2.00	2.00

Replaced 2nd paragraph of section 92-1.02B with:

07-19-13

PG modified asphalt binder must comply with the requirements shown in the following table:

PG Modified Asphalt Binder

Property	AASHTO Test Method	Grade		
		PG 58–34 M	PG 64–28 M	PG 76–22 M
Original Binder				
Flash point, min °C	T 48	230	230	230
Solubility, min %	T 44[a]	97.5	97.5	97.5[b]
Viscosity at 135 °C[c], max, Pa·s	T 316	3.0	3.0	3.0
Dynamic shear, Test temperature at 10 rad/s, °C min G*/sin(delta), kPa	T 315	58 1.00	64 1.00	76 1.00
RTFO test[d], Mass loss, max, %	T 240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic shear, Test temperature at 10 rad/s, °C min G*/sin(delta), kPa	T 315	58 2.20	64 2.20	76 2.20
Dynamic shear, Test temperature at 10 rad/s, °C max (delta), degree	T 315	80[e]	80[e]	80[e]
Elastic recovery[f], Test temperature °C min recovery, %	T 301	25 75	25 75	25 65
PAV[g], temperature, °C	R 28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic shear, Test temperature at 10 rad/s, °C max G*sin(delta), kPa	T 315	16 5000	22 5000	31 5000
Creep stiffness, Test temperature, °C max S-value, MPa min M-value	T 313	-24 300 0.300	-18 300 0.300	-12 300 0.300

[a]The Department allows ASTM D 5546 or ASTM D 7753 instead of AASHTO T 44. Particles recovered from ASTM D 5546 or ASTM D 7753 or AASHTO T 44 must be less than 250 µm.
[b]Report only for spray application.
[c]The Engineer waives this specification if the supplier provides written certification the asphalt can be adequately pumped and mixed at temperatures meeting applicable safety standards.
[d]"RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T 240 or ASTM D 2872. The residue from mass change determination may be used for other tests.
[e]Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The graph must have at least two points that envelope G*/sin(delta) of 2.2 kPa and the test temperature must not be more than 6 degree C apart. The Engineer also accepts direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
[f]Tests without a force ductility clamp may be performed.
[g]"PAV" means "Pressure Aging Vessel."

Do not modify PG modified asphalt binder using polyphosphoric acid.

Crumb rubber must be from automobile and truck tires and must be free from contaminants including fabric, metal, minerals, and other nonrubber substances.

PG modified asphalt binder modified with crumb rubber must be homogeneous and must not contain visible particles of crumb rubber.

The supplier of PG modified asphalt binder modified with crumb rubber must:

1. Report the amount of crumb rubber by weight of asphalt binder
2. Certify a minimum of 10 percent of crumb rubber by weight of asphalt binder

^^

93 LIQUID ASPHALTS

07-19-13

Replace "Celsius" the 1st row in the table in the 8th paragraph of section 93-1.04 with:

07-19-13

Fahrenheit