08

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

AND

SPECIAL PROVISIONS

FOR BUILDING CONSTRUCTION SAN BERNARDINO COUNTY AT THE CALTRANS MAINTENANCE STATION 175 WEST CLUSTER STREET SAN BERNARDINO, CALIFORNIA 92402

In District 08 On Route L5726

Under

***Bid* book dated April 18, 2016**	***Standard Specifications* dated 2010**
Project plans approved February 16, 2016	***Standard Plans* dated 2010**

Identified by

Contract No. 08-0K8414

08-SBd-L5726-L5726

Project ID 0814000073

Electronic Bidding Contract

AADD

Bids open Wednesday, May 11, 2016 **OSD**

Dated April 18, 2016 **IH**

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SPECIAL NOTICES

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- See sections 2 and 3 for contractors' registration requirements.

CONTRACT NO. 08—0k8414
PROJECT ID: 08140000731

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

ARCHITECT

Hassan Akhavan 2/12/16

LICENSED ARCHITECT DATE

LICENSED ARCHITECT
Hassan Akhavan
No. C-20451
Exp. 04-30-17
STATE OF CALIFORNIA

STRUCTURES

Gang Hong 2/12/16

REGISTERED CIVIL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
Gang Hong
No. C-60406
Exp. 06-30-16
CIVIL
STATE OF CALIFORNIA

MECHANICAL

Shahjahan Ali Shahjahan Ali 2/12/16

REGISTERED MECHANICAL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
Sahjahan Ali
No. M-32144
Exp. 09-30-16
MECH.
STATE OF CALIFORNIA

ELECTRICAL

Jipinderpal Kaur 02/12/16

REGISTERED ELECTRICAL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
Jipinderpal Kaur
No. E-21098
Exp. 03-31-17
ELECT.
STATE OF CALIFORNIA

CONTRACT NO. 08—0k8414
PROJECT ID: 08140000731

WATER AND WASTEWATER

Gerhard Panuschka

REGISTERED CIVIL ENGINEER DATE

G. Panuschka 12 Feb 2016

REGISTERED PROFESSIONAL ENGINEER
Gerhard Panuschka
No. C-52670
Exp. 12-31-16
CIVIL
STATE OF CALIFORNIA

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REVISED STANDARD SPECIFICATIONS APPLICABLE TO THE 2010 EDITION OF THE STANDARD SPECIFICATIONS 159

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)
RSP A85	Chain Link Fence
A85A	Chain Link Fence Details
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)
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-1B	Electrical Systems (Legend and Abbreviations)
RSP ES-1C	Electrical Systems (Legend and Abbreviations)
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
A40A	01-15-16	A77J3	07-19-13	S135	07-19-13
A77A1	07-19-13	A77J4	07-19-13	ES-6H	07-19-13
A77A2	07-19-13	A77K1	07-19-13	ES-6I	07-19-13
A77B1	07-19-13	A77K2	07-19-13	ES-6J	07-19-13
A77C1	07-19-13	P3	07-19-13	ES-7I	07-19-13
A77C2	07-19-13	C8A	07-19-13	ES-8	01-20-12
A77C3	07-19-13	C8B	07-19-13	ES-10	07-20-12
A77C4	07-19-13	C8C	07-19-13	ES-12A	10-30-15
RSP A77C5	07-19-13	D98D	10-30-15	ES-12B	10-30-15
RSP A77C6	07-19-13	D98E	10-30-15		
RSP A77C7	07-19-13	B3-1	04-20-12		
RSP A77C8	07-19-13	B3-2	04-20-12		
RSP A77C9	07-19-13	B3-3	04-20-12		
RSP A77C10	07-19-13	B3-4	04-20-12		
A77E1	07-19-13	B3-7	04-20-12		
A77E2	07-19-13	B3-8	04-20-12		
A77E3	07-19-13	S7	07-19-13		
A77E4	07-19-13	S14	07-19-13		
A77E5	07-19-13	S41	07-19-13		
A77E6	07-19-13	S42	07-19-13		
A77F1	07-19-13	S43	07-19-13		
A77F2	07-19-13	S44	07-19-13		
A77F3	07-19-13	S45	07-19-13		
A77F4	07-19-13	S46	07-19-13		
A77F5	07-19-13	S47	07-19-13		
A77G1	07-19-13	S120	07-19-13		
A77G2	07-19-13	S121	07-19-13		
A77G3	07-19-13	S122	07-19-13		
A77G4	07-19-13	S123	07-19-13		
A77G5	07-19-13	S124	07-19-13		
A77G6	07-19-13	S125	07-19-13		
A77G7	07-19-13	S126	07-19-13		
A77G8	07-19-13	S127	07-19-13		
A77H1	07-19-13	S128	07-19-13		
A77H2	07-19-13	S129	07-19-13		
A77H3	07-19-13	S130	07-19-13		
A77I1	07-19-13	S131	07-19-13		
A77I2	07-19-13	S132	07-19-13		
A77J1	07-19-13	S133	07-19-13		
A77J2	07-19-13	S134	07-19-13		

NOTICE TO BIDDERS

Bids open Wednesday, May 11, 2016

Dated April 18, 2016

General work description: Construct office building

The Department will receive sealed bids for BUILDING CONSTRUCTION SAN BERNARDINO COUNTY AT THE CALTRANS MAINTENANCE STATION 175 WEST CLUSTER STREET SAN BERNARDINO, CALIFORNIA 92402.

District-County-Route-Post Mile: 08-SBd-L5726-L5726

Contract No. 08-0K8414

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

The DVBE Contract goal is 5 percent.

Bids must be on a unit price basis.

Complete the work within 165 working days.

The estimated cost of the project is $880,000.

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

The Department will open and publicly read the bids at 1727 30th Street, Bidders' Exchange, MS 26, Sacramento, CA 95816 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.

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

Department of Transportation

D08

BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	130100	JOB SITE MANAGEMENT	LS	LUMP SUM
2	130200	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
3	150608	REMOVE CHAIN LINK FENCE	LF	80
4	800103	TEMPORARY FENCE (TYPE CL-6)	LF	130
5	994650	BUILDING WORK	LS	LUMP SUM

SPECIAL PROVISIONS

ORGANIZATION

Special provisions 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*.

Each special provisionbegins with a revision clause that describes or introduces a revision to the *Standard Specifications* as revised by any revised standard specification.

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*.

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DIVISION I GENERAL PROVISIONS

2 BIDDING

Add between the 1st and 2nd paragraphs of section 2-1.06B:

The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the *Information Handout*	Foundation Recommendation dated October 28, 2014

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reuse: Reuse of salvaged items in substantially the same form within the limits specified by the *LEED Reference Guide*. For purposes of construction waste management, "reuse" refers to items found on-site that were fixed components before construction began

salvage: Recovery of construction and demolition waste for subsequent reuse. For LEED purposes, "salvage" includes removal by you for reuse by you or others and keeping and storage by the Department for future reuse.

10-2.03B(3) Submittals

10-2.03B(3)(a) General

Not Used

10-2.03B(3)(b) Quality Control and Assurance Submittals

Submit a qualification statement for your waste management coordinator.

Submit a waste management plan within 30 days after Contract approval.

10-2.03B(3)(c) Closeout Submittals

Submit calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the work.

Submit records of donations and sales of salvageable waste to individuals or organizations. Include receipts with itemized descriptions. Show whether organization is tax exempt.

Submit records showing receipt and acceptance of recyclable wastes by recycling facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

Submit records indicating receipt and acceptance of wastes by landfills licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

10-2.03B(4) Quality Control and Assurance

Designate a waste management coordinator to implement, monitor, and report on the waste management plan. The coordinator must be present as necessary at the job site to fully oversee compliance with waste management requirements. The coordinator must be conversant with LEED requirements related to materials and resources and specifically related to MR Credit 2, Construction Waste Management. The LEED manager may serve as the waste management coordinator.

Conduct a waste management conference at job site before work starts and as necessary during the work. Require attendance by superintendents, supervisors, subcontractors, and your workers; invite Engineer. Include a review of:

1. Waste management plan and related responsibilities of waste management coordinator
2. How to document the quantity of each type of waste and its disposition
3. Procedures for materials separation and available containers and bins
4. Waste collection and transport to recycling and disposal facilities
5. Waste management requirements for each trade

10-2.03B(5) Performance Goals

Recycle or salvage from the waste stream at least 65 percent by weight or volume of total nonhazardous construction and demolition waste generated by the work.

The Department's goal is to salvage and recycle as much nonhazardous construction and demolition waste as possible, including any of the following materials:

1. PCC and asphalt concrete
2. CMU and other masonry
3. Structural steel and miscellaneous steel, metal studs, reinforcing steel
4. Wood
5. Cabinets
6. Roofing
7. Insulation

8. Doors and frames
9. Windows
10. Glazing
11. Hardware
12. Gypsum board
13. Acoustical tile and panels
14. Carpet and pad
15. Demountable partitions
16. Equipment
17. Piping
18. Conduit
19. Copper wiring
20. Supports and hangers
21. Valves
22. Sprinklers
23. Plumbing fixtures
24. Mechanical equipment
25. Lighting fixtures
26. Lamps and ballasts
27. Electrical devices
28. Switchgear and panelboards
29. Transformers
30. The following packaging materials:
    30.1. Paper
    30.2. Cardboard
    30.3. Boxes
    30.4. Plastic sheet and film
    30.5. Polystyrene packaging
    30.6. Wood crates
    30.7. Plastic pails

Salvage or recycle 100 percent of any uncontaminated packaging materials listed above.

Recycle beverage containers and clean paper used by workers.

10-2.03B(6) Waste Management Plan

Develop a waste management plan that includes waste identification and waste reduction work plan. Distinguish between demolition and construction waste. Measure quantities by either weight in tons or volume in cubic yards. Use the same units of measure for all materials.

Identify a waste management coordinator .

Identify anticipated types of demolition and construction waste generated by the work. Include estimated quantities and assumptions for estimates.

List each type of waste and whether it will be salvaged, recycled, or disposed of. Include total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials: List names, addresses, and telephone numbers of individuals or organizations to which materials will be sold or donated for reuse.
2. Recycled Materials: List local receivers and processors and types of recycled materials each will accept. Include names, addresses, and phone numbers.
3. Disposed Materials: Provide name, address, and phone number of landfill where materials will be disposed of.
4. Handling and Transportation Procedures: Describe method that will be used for separating recyclable waste, including sizes of containers, container labeling, and designated job site location where materials will be separated. Indicate whether recyclable or salvageable materials will be segregated onsite or commingled for sorting offsite. Include provisions for complying with section 13-4.

To identify recyclers, salvage operators, disposal locations, and waste disposal restrictions, at a minimum coordinate with City of San Bernardino Public Works-Integrated Waste Management Division.

10-2.03B(7) Waste Management Plan Implementation

Implement the waste management plan.

Train workers, subcontractors, and suppliers on proper waste management procedures. Distribute the waste management plan to responsible staff, subcontractors, and suppliers immediately after authorization by the Department and to new firms when they start work at the job site. Review procedures and locations for salvage, recycling, and disposal.

You will keep revenues and other incentives received for recycling and salvaging waste materials.

10-2.03B(8) General Recycling and Salvage Procedures

Separate recyclable and salvageable waste from other waste materials, trash, and debris. Separate recyclable and salvageable waste by type at the job site to the greatest extent possible.

Furnish appropriately marked containers or bins. Submit a list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination daily and remove unacceptable materials if found. Presence of unacceptable materials may cause the entire load to be rejected by the recycler or salvager and thus prevent achievement of waste diversion goals.

Keep recyclable materials free from dirt, adhesives, solvents, petroleum, and other deleterious substances, including nonrecyclable wastes.

Transport recyclable waste to recycler.

10-2.03B(9) Salvage Procedures

Clean salvaged items, pack in labeled containers, and store in a secure area until removal or reuse.

Salvage materials under the corresponding procedures shown in the following table:

Salvaging Procedures

Material	Procedure
Doors and hardware	Brace open end of door frames. Except for door closers, leave door hardware attached to doors.
Equipment	Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
Plumbing fixtures	Separate by type and size.
Lighting fixtures	Separate lamps by type and protect from breakage.
Electrical devices	Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

10-2.03B(10) Material-Specific Recycling Procedures

Recycle materials under the corresponding procedures shown in the following table:

Recycling Procedures

Material	Procedure
Packaging	
Cardboard and boxes	Break down packaging into flat sheets. Bundle and store in a dry location.
Polystyrene packaging	Separate and bag materials.
Pallets	As much as possible, require deliverers using pallets to remove pallets from the job site for reuse. Break down remaining pallets into component pieces and recycle as wood.
Crates	Break down crates into component pieces and recycle as wood.
Asphalt concrete	Break up and transport paving to asphalt-recycling facility.
Concrete	Remove reinforcement and other metals from concrete and sort with other metals. Break up and dispose of concrete.
Masonry	Remove reinforcement, anchors, and ties from masonry and sort with other metals. Clean and stack undamaged, whole masonry units on wood pallets.
Wood	Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
Metals	Separate metals by type. Remove bolts, nuts, washers, and other rough hardware.
Structural steel	Stack members according to size, type of member, and length.
Ceiling suspension systems	Disassemble to convenient size.
Asphalt shingle roofing	Separate organic and glass-fiber asphalt shingles and felts.
Gypsum board, large pieces	Stack clean pieces on wood pallets and store in a dry location.
Acoustical ceiling panels and tile, large pieces	Stack clean pieces on wood pallets and store in a dry location.
Carpet and pad	Roll large pieces tightly after removing debris, trash, adhesive, and tack strips. Store in a closed container or trailer provided by carpet recycler.
Piping	Reduce piping to straight lengths and sort by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
Conduit	Reduce conduit to straight lengths. Sort by type and size.

Replace section 10-2.03C with:

10-2.03C Indoor Air Quality Management

Section 10-2.03C includes specifications for reducing or avoiding construction impacts on IAQ.

For IEQ , submit:

1. Construction IAQ management plan addressing control measures to be used during construction
2. Schedule of temporary air filtration media, including manufacturer, model no., MERV rating, and location of installed filter
3. Documentation as to whether HVAC system was used during construction
4. Documentation that each installed filter was replaced before occupancy
5. Product data for temporary and permanent filtration media
6. 6 photographs taken at 3 different occasions during construction to document control measures used with a brief description of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) approaches used

For IEQ , submit:

1. Construction IAQ management plan addressing measures before occupancy
2. Documentation describing building air flush-out procedures used, including starting and ending dates and documentation that filtration media were replaced after flush-out
3. Product data for filtration media used during flush-out and installed before occupancy
4. Report from a testing and inspection agency of air quality testing showing compliance of results, procedures, and protocols with LEED requirements

For IEQ , prepare a construction IAQ management plan covering measures to be used during construction. The measures must include:

1. Achieving or exceeding the recommended control measures of SMACNA *IAQ Guidelines for Occupied Buildings Under Construction*, 2nd Edition 2007, chapter 3. Include measures for HVAC protection, source control, pathway interruption, housekeeping, and scheduling
2 Protecting stored on-site and installed absorptive materials from moisture damage
3. Not using permanently installed air handlers during construction
3. Providing filtration media with a MERV of 8 at each return air grille and replacing filtration media immediately before occupancy if permanently installed air handlers are used during construction
4. Installing MERV 13 filtration media immediately before occupancy.

For IEQ Credit 3.2, prepare a construction IAQ management plan covering measures before occupancy. Include the following alternate compliance methods from which the Department may choose:

1. After construction ends and before occupancy and with all interior finishes installed, install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.
2. After construction ends and before occupancy and with all interior finishes installed, conduct baseline IAQ testing using testing protocols and methods as described in the *LEED Reference Guide*. Conduct sampling, testing, flush-out, and additional testing until the maximum concentrations given in the *LEED Reference Guide* are not exceeded for the following contaminants: formaldehyde, particulates (PM10), total volatile organic compounds (TVOCs), 4-phenylcyclohexene (4-PCH), and carbon monoxide.

Implement construction IAQ management plans as authorized by the Department.

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D. The styles of section 99 differ from the styles of the other sections in that:
   1. The 5-digit number that follows "99-" and the title of each correlate with the 16-division CSI MasterFormat number and title except as specified below.
   2. Within section 99, the Department is gradually changing the specifications to align with CSI's MasterFormat styles and 50-division CSI MasterFormat numbers. Because of this transition, the format, organization, and language may vary between sections. Until the transition is complete, a 50-division section number 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
CBC	California Building Code
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 30 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.
G. The sum of the items listed in the schedule of values must equal the contract lump sum price for building work. Do not list overhead and profit. Include bond premiums and other such items in the mobilization bid item for the entire project.

1.8 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

99-2 SITEWORK

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

99-02071 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

99-02071(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

Not Used

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

99-02075 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

99-02220 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.

Select Backfill: Select backfill must comply with the requirements specified under section 99-02234.

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.

Select Backfill: At the locations and to the limits shown, materials below the bottom of footings or foundations must be removed and replaced with select backfill material under the placing requirements of 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.

Select Backfill:

Select backfill must be compacted to not less than 95 percent relative compaction.

A relative compaction of not less than 95 percent must be obtained for a minimum depth of 6 inches below the bottom of the excavation before placing select backfill.

Trench Backfill: Trench backfill placed beneath slabs or paved areas 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 disposed of at the site of the work as directed by the Engineer.

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

99-02234 AGGREGATE BASE

99-02234A General

99-02234A(1) Summary

Scope: This work consists of furnishing, spreading, and compacting aggregate base.

99-2.04A(2) Definitions

Not Used

99-02234A(3) Submittals

99-02234A(4) Quality Control and Assurance

Not Used

99-02234B Materials

Aggregate base:

Aggregate base must be commercial quality aggregates consisting of broken stone; crushed gravel; natural, clean, rough-surfaced gravel and sand; or a combination thereof.

Aggregate base must comply with the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
1"	100
3/4"	90–100
No. 4	35–60
No. 30	10–30
No. 200	2–9

Aggregate base must also comply with the following quality requirements:

Tests	California Test No.	Test Requirements
Durability Index	229	35 Min.
Resistance (R-Value)	301	78 Min.
Sand Equivalent	217	22 Min.

99-02234C Construction

Spreading:

Aggregate base must be placed and compacted to the lines and grades shown.

Spreading and compacting must be performed by methods that will produce a uniform base, free from pockets of coarse or fine material.

Compaction: Relative compaction of each layer of compacted base material must be not less than 95 percent, as determined by California Test 216 or 231.

99-02234D Payment

Not Used

99-02585 PAINTED PAVEMENT MARKINGS

99-02585A General

99-02585A(1) Summary

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

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

99-02585A(2) Definitions

Not Used

99-02585A(3) Submittals

Not Used

99-02585A(4) Quality Control and Assurance

Not Used

99-02585B Materials

Paint:

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

Traffic paint must comply with the rules for control of volatile organic compound (VOC) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

Temporary (Removable) Striping and Pavement Marking Tape (6 months or less): Products used for temporary (removable) striping and pavement marking tape (6 months or less) must be selected from the pre-qualified products list below:

1. Advanced Traffic Marking, Series 200
2. Brite-Line, Series 100
3. Garlock Rubber Technologies, Series 2000
4. P.B. Laminations, Aztec, Grade 102
5. Swarco Industries, "Director-2"
6. Trelleborg Industries, R140 Series
7. 3M Series 620 "CR", and Series A750
8. 3M Series A145, Removable Black Line Mask
   (Black Tape: for use only on Asphalt Concrete Surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"
   (Black Tape: for use only on Asphalt Concrete Surfaces)
10. Brite-Line "BTR" Black Removable Tape
    (Black Tape: for use only on Asphalt Concrete Surfaces)
11. Trelleborg Industries, RB-140
    (Black Tape: for use only on Asphalt Concrete Surfaces)

99-02585C Construction

Alignment and Layout:

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

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

Equipment and Operation:

Mechanical means must be used to paint pavement markings.

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

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

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

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

Surface Preparation: Surfaces to receive paint, temporary striping, or pavement marking tape must be cleaned of all dirt and loose material.

Application:

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

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

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

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

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

Temporary striping and pavement marking tape must be applied under the manufacturer's instructions.

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

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

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

99-02585D Payment

Not Used

99-02730 SANITARY SEWAGE DISPOSAL SYSTEM

99-02730A General

99-02730(1) Summary

Scope: This work consists of installing and constructing a sanitary sewage system.

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

Related Work: Sewer pipes in buildings, and to a point 5 feet beyond the building, must comply with section 99-15.

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.

99-02730A(2) Definitions

Not Used

99-02730A(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 must be submitted for the following:

1. Underground tracer tape
2. Sewer pipe and fittings
3. Sewer pipe adapters
4. Drain pipe and fittings
5. Manhole
6. Manhole frame and cover
7. Coatings
8. Valve box
9. Meter box
10. Cleanouts

Certificates of Compliance: Submit a certificates of compliance for manhole covers and frames.

99-02730A(4) Quality Control and Assurance

Codes and Standards: All sanitary sewage work must comply with the applicable portions of the California Plumbing Code (CPC).

99-02730B Materials

99-02730B(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".

99-02730B(2) Pipes and Fittings

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

Sewer and Drain Pipe: Sewer and 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 bell and spigot rubber gasketed joints or complying with ASTM D2665 with solvent welded fittings. Rubber gaskets must comply with ASTM F 477. Stainless steel clamps with rubber boots must not be used.

Sewer Pipe Adapters: Sewer pipe adapters for PVC to cast iron soil pipe or clay piping must be appropriately sized PVC flexible coupling manufactured for connecting dissimilar pipes. Adapters must be attached to piping with adjustable stainless steel band clamps with hex tightening screws. Rubber boots will not be allowed. Sewer pipe adapter must be Indiana Seal; Fernco; or equal.

99-02730B(3) Sewer Manholes

Manhole: Manhole and distribution box riser sections and cones 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 30 or greater (traffic type). Cover must be no bolt, closed pick hole and must be marked "SS," "SEWER," or "SANITARY SEWER". The side or bottom of the cover 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.

99-02730B(4) Valve and Meter Boxes

Valve Box: Valve box must be precast concrete box with cast iron cover. Cover must be factory marked "SEWER," "SS," or "SANITARY SEWER" and must be traffic rated. Valve box must be Cook Concrete Products, No. 10-T-12; Christy No. G-5C; Brooks, No. 3-RT; or equal with extensions as required.

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.

99-02730B(5) Cleanouts and Valves

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.

Gravity Check Valve: Gravity check valve must be 4-inch, hub ends, polyvinyl chloride (PVC) body, rated for 125 psi minimum back pressure, no metallic parts, angled viton compound rubber or fluorocarbon compound seat and removable flapper rated for horizontal or vertical usage, unseated pressure opens on contact, full flow design. Valve must be Flo Control Inc., R and G Sloane, NDS Inc., or equal.

99-02730B(6) Coatings

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

99-02730B(7) Miscellaneous Materials

Cement Mortar: Cement mortar must be 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 a commercial quality, trowelable, 3-component epoxy mortar consisting of 2 pourable epoxy components and a chemically resistant aggregate filler of silica quartz sand with a maximum water absorption of 0.1 percent. Epoxy must have a pull-off strength of not less than 1,000 psi and a 90 percent cure in 24 hours. Epoxy mortar must be the type that requires no primer as a bonding agent.

99-02730C Construction

99-02730C(1) Installation of Identification

Continuous underground tracer tape must be installed directly above buried lines and 6 inches to 12 inches below finished grade during backfilling operations.

99-02730C(2) Installation of Pipes and Fittings

Sewer and drain pipe must be installed upgrade (starting from utility connection back to the construction) unless otherwise authorized 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.

Sewers Near Water Lines: Sewers near water lines must be installed below water lines in the same trench, in parallel trenches less than 10 feet apart, or at any crossing.

When water lines cross above a sewer line, a vertical separation of not less than 12 inches must be maintained between the top of the sewer pipe and the bottom of the water line.

Connections between Differing Pipe Types: Joints between different types of pipes must be made with sewer pipe adapters intended for that purpose.

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.

99-02730C(3) Installation of Manholes and Valve and Meter Boxes

Manholes and valve and meter boxes must be installed under the manufacturer's instructions.

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

A concrete collar must be formed and cast in place around each manhole under the details shown.

Where new manholes, valve or meter boxes 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.

99-02730C(4) Installation of Cleanouts

Cleanouts must be installed 90 degrees to finished grade and must terminate in a valve box. A concrete pad must be provided full width of the trench under a wye 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.

Collars must be broom surface finished. Collars must match existing/finished grade. Compaction prior to form work must be as described elsewhere.

99-02730C(5) Application of Coatings

The interior and exterior surfaces of concrete sewer 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.

99-02730C(6) Field Quality Control

Testing Pipes:

> All sewer and drain pipes must be tested for obstructions before covering the pipes by balling and flushing the pipes with an authorized commercial sewer cleaning ball. The ball must be moved slowly through the sewer with a tag line. Four-inch sewer pipe must be tested by pulling an appropriate sized inflatable plug through the pipe. Obstructions or irregularities must be removed or repaired.
>
> Sewer and drain 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 sewer pipe, or to the top of the manholes where less than 4 feet deep. The system must show no visible leaks, and the leakage rate must not exceed the rate allowed by the local agency. In the absence of such requirements, leakage must not exceed one pint per 24 hours, per millimeter diameter, per 100 feet of pipe. Sewer pipes may be tested in sections with the test water progressively passed down the sewers if feasible. Water must be released at a rate which will not create water hammer or surge in the plugged section of sewer.
>
> In lieu of hydrostatic test with water, the air test method, "Air Test," as outlined in the CPC, may be used.

99-02730D Payment

Not Used

99-02844 PARKING BUMPERS

99-02844A General

99-02844A(1) Summary

Scope: This work consists of installing precast concrete parking bumpers.

99-02844A(2) Definitions

Not Used

99-02844A(3) Submittals

Not Used

99-02844A(4) Quality Control and Assurance

Not Used

99-02844B Materials

Parking Bumpers:

Parking bumpers must be commercially available precast parking bumpers.

Parking Bumpers must be 48 inches long, nominal 8 inches wide, and 6 inches high with both top longitudinal corners continuously chamfered, and anchor holes 9 inches from each end.

99-02844C Construction

Layout:

Arrangement of parking bumpers must be coordinated with the layout of parking stalls and traffic aisles, providing the proper angle to engage wheels and proper location to prevent overtravel of vehicles.

Parking bumpers must be anchored with two 3/4- inch diameter reinforcing bars 15 inches in length. The reinforcing bars must be installed such that the top of the bars is flush with the top of the parking bumper.

99-02844D Payment

Not Used

99-02846 ACCESSIBLE PARKING SIGNS

99-02846A General

99-02846A(1) Summary

Scope: This work consists of installing accessible parking signs.

99-02846A(2) Definitions

Not Used

99-02846A(3) Submittals

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

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

99-02846A(4) Quality Control and Assurance

Regulatory Requirements: Accessible parking signs must comply with the requirements in Identification of parking spaces for off-street parking facilities, 24 CA Code of Regs Pt 2 CBC Sections 11B - 502.6 and 11B - 502.8, and Stopping, Standing, and Parking, CA Veh Code §§ 22500 through 22526.

99-02846B Materials

Sign Colors: The color white must comply with the requirements in FED-STD-595, Color No. 17886. The color blue must comply with the requirements in FED-STD-595, Color No. 15090.

Signs:

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

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

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

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

The face of each finished sign must be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels must be free of router chatter marks, burns, sharp edges, delaminated skins, excessive adhesive over spray and aluminum marks.

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

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

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

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

99-02846C Construction

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

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

99-02846D Payment

Not Used

99-3 CONCRETE AND REINFORCEMENT

99-03300 CAST-IN-PLACE CONCRETE

99-03300A General

99-03300A(1) Summary

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

Concrete:

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

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

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

99-03300A(2) Definitions

Not Used

99-03300A(3) Submittals

Product Data:

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

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

Concrete Mix Designs: Submit copies of concrete mix designs.

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

99-03300A(4) Quality Control and Assurance

Not Used

99-03300B Materials

99-03300B(1) Concrete Mixes

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

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

Notes:
[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.

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

99-03300B(2) Colored Concrete

99-03300B(3) Form Materials

Forms for Exposed Finish Concrete:

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

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

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

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

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

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

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

99-03300B(4) Reinforcement

Not Used

99-03300B(5) Epoxy

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

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

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

Sand:

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

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

99-03300B(6) Related Materials

Anchor Bolts and Anchor Rods, Nuts and Washers:

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

Nuts: Comply with ASTM A 563.

Washers:

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

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

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

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.

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.

Placing Reinforcement:

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

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

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

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

99-03300C(2) Placing Concrete

Concrete must be placed under section 51-1.03D.

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

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

99-03300C(3) Colored Concrete

Not Used

99-03300C(4) Finishing Concrete Surfaces

Finishing Unformed Surfaces:

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

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

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

The application of cement dust coat will not be permitted.

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

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

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

Finishing Formed Surfaces:

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

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

Nonskid Abrasive Aggregate Finish: Where shown, walkways must receive a nonskid abrasive aggregate (grit) finish. The grit must be applied uniformly at the rate of not less than 0.3 pound per square foot and tamped into the floated concrete surface while the concrete is plastic. The grit must be buried about 0.7 diameter of each particle into the concrete.

99-03300C(5) Curing Concrete

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

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

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

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

99-03300C(6) Protecting Concrete

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

99-03300C(7) Special Treatments

Concrete Hardener:

> Chemical concrete hardener must be applied to the floor surfaces shown, prior to the application of concrete sealer. Surfaces must be clean and dry before the application of hardener.
>
> The solution must be applied under the manufacturer's instructions.
>
> After the hardener has dried, the surface must be mopped with water to remove encrusted salts.

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

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

Epoxy Mortars:

> Epoxy for use as a binder in epoxy mortars must be thoroughly mixed together before the aggregate is added, and unless otherwise specified, the mix proportions must consist of one part binder to approximately 4 parts of aggregate, by volume.
>
> All surfaces against which epoxy mortars are to be applied must be free of rust, paint, grease, asphalt, and loose or deleterious material.

99-03300D Payment

Not Used

99-4 MASONRY

Not Used

99-5 METALS

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

Not Used

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

1. Hollow structural sections

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:

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

Stud Connectors: Comply with ASTM A 108, AISI Grades 1018 through 1020, cold drawn, either semi- or fully kilned.

Anchor Bolts and Anchor Rods, Nuts and Washers:

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

Nuts: Comply with ASTM A 563.

Washers:

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

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

Machine Bolts, Nuts, and Washers:

Machine Bolts: Comply with ASTM A 307.

Nuts: Comply with ASTM A 563.

Washers: Commercial quality.

High Strength (HS) Fastener Assemblies:

HS Bolts: Comply with ASTM A 325 or A 490 when shown.

Nuts: Comply with ASTM A 563.

Washers: Comply with ASTM F 436, Type 1.

Direct Tension Indicators: Comply with ASTM F 959.

Tension Control Bolts: Comply with ASTM F 1852.

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.

Stud Connectors: Prepare steel surfaces as recommended by manufacturer of stud connectors. Use automatic end welding of stud connectors under AWS D1.1/D1.1M and manufacturer's instructions.

Connections:

1. Clean abutting surfaces at connections.
2. Do not cut or weld at the 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.

HS Fastener Assemblies:

Assemble and install HS fastener assemblies under RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
Joint Type:
1. Snug tightened when no joint type is shown.
2. Pretensioned or slip critical when joint type is shown as such.

Galvanize HS fastener assemblies, or equivalent fasteners, by mechanically deposited coating process.

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

Install nuts on side of member least exposed to view.

Welded Connections: Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

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

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.

HS Bolted Connections: Contact surfaces of HS bolted connections and ungalvanized anchorage assemblies must be coated before assembly. The total thickness of primer on each faying surface of slip-critical joints must be between 1 mil and the maximum allowable dry film thickness determined under the RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

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.
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

99-05500 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. Channels
2. Angels
3. Plates

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.

Loose Bearing and Leveling Plates: Loose bearing and leveling plates must be provided for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Plates must be drilled to receive anchor bolts. Galvanize after fabrication.

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

99-06100 ROUGH CARPENTRY

99-06100A General

99-06100A(1) Summary

Scope: This work must consist of furnishing and installing materials and performing rough carpentry work including wood framing, furring, and sheathing.

Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed.

99-06100A(2) Definitions

Not Used

99-06100A(3) Submittals

Product Data: Manufacturer's material data and installation instructions must be submitted for gypsum sheathing, framing hardware, and underlayments.

Wood Treatment Data:

> Chemical treatment manufacturer's instructions must be submitted for the handling, sorting, installation, and finishing of treated materials.
>
> For each type of preservative treatment used, certification by treating plant must include type of preservative solution and pressure process used, net amount of preservative retained and conformance with the applicable standards of the American Wood Protection Association.
>
> For each type of fire-retardant treatment, include certification by treating plant that the treated material complies with the applicable standards and other requirements.

99-06100A(4) Quality Control and Assurance

Not Used

99-06100A(5) Delivery, Handling, and Storage

Delivery and Storage: Materials must be kept under cover and dry. All materials must be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All lumber, plywood and other panels must be stacked in such a manner to provide air circulation within and around the stacks.

99-06100B Materials

99-06100B(1) Lumber

Lumber must be manufactured to comply with PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection.

Softwood lumber must be quality grade stamped or must be accompanied by a certificate of inspection. Inspection certificates or grade stamps must indicate compliance with the grading requirements of WWPA, WCLIB, RIS, or other approved lumber inspection agencies.

All lumber used must be nominal sized and dressed S4S unless otherwise described.

Framing lumber must be solid stock lumber, Douglas Fir-Larch, and the grades indicated under WCLIB or WWPA rules. Moisture content must not exceed 19 percent and must be grade stamped "S-Dry."

99-06100B(2) Dimension Lumber

Except as otherwise shown, lumber must have the following grades.

Vertical Framing Lumber:

Vertical framing lumber, nominal 2 inches x 2 inches through 4 inches x 4 inches, must be Construction grade or better.

Vertical framing lumber, nominal 2 inches x 6 inches through 4 inches x 6 inches, must be No. 2 or better.

Horizontal Framing Lumber:

Horizontal framing lumber, nominal 2 inches x 4 inches and wider, including joists and rafters, must be No. 2 or better.

Horizontal framing lumber, nominal 4 inches x 4 inches and wider, including joist and rafters, must be No. 1 or better.

Exposed Framing Lumber: Exposed framing lumber which is not concealed and is to receive a stain or natural finish must be the same grade and species as indicated for structural framing and hand selected for appearance.

Miscellaneous Lumber:

Miscellaneous lumber for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members must be not less than No. 2 or better.

Lumber in contact with concrete or masonry construction must be pressure treated Douglas Fir-Larch.

99-06100B(3) Timbers

Timbers (Nominal 5 inches or Thicker): Timbers must be No. 1 or better.

99-06100B(4) PlywoodPanels

Plywoodpanels must comply with Voluntary Product Standard PS 1, "Structural Plywood," or its predecessor, " Construction and Industrial Plywood."

Plywood panels must be Group 1 unless otherwise noted.

Each plywood panel must be factory marked with APA or other trademark evidencing compliance with grade requirements.

Structural Plywood Wall Sheathing: Structural plywood wall sheathing for walls must be APA RATED SHEATHING, Exposure 1. Thickness and grade must be as shown.

Structural Plywood Roof Sheathing:

Structure plywood roof sheathing must be APA RATED SHEATHING, Exposure 1. Span rating, thickness and grade must be as shown.

Structure plywood roof sheathing in exposed overhangs must be APA RATED SHEATHING, A-C, Exterior, Group 1. Thickness must be the same as the remainder of the sheathing.

Plywood Decking: Plywood decking must be APA RATED STURD-I-FLOOR, Exposure 1, with tongue-and-groove edges. Span rating and thickness must be as shown.

99-06100B(5) Miscellaneous Materials

Rough Carpentry Hardware:

Steel plates and rolled sections must be mild, weldable steel, complying with AISI grades 1016 through 1030 except 1017.

Nails, screws, bolts, nuts, washers must be commercial quality. Exposed fasteners must be hot dipped galvanized or stainless steel. Fasteners for use with preservative treated wood must be hot dip galvanized.

Joist hangers, clips and other standard framing hardware must be ICC approved, commercial quality, galvanized sheet steel or hot dipped galvanized, of the size shown.

Expansion anchors and powder driven anchors must comply with section 99-05500.

Nails: Nails must comply with ASTM F 1667. "Common" nails must comply with the following table:

Nail Size	Length (inches)	Diameter (inches)
8d	2½	0.131
10d	3	0.148
16d	3½	0.162

Building Paper: Building paper must be kraft type waterproofing building paper, Type I (No. 15) asphalt saturated roofing felt or high density, bonded polyethylene fiber building paper.

Adhesive: Adhesive for plywood glue-nailed systems must comply with APA Specification: AFG-01.

99-06100B(6) Wood Treatment By Pressure Process

Preservative Treatment:

Preservative treatment must be copper napthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

The following items must be treated:

Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
Wood sills, sleepers, blocking, furring and other similar members in contact with concrete or masonry.
All holes, daps and cut ends of treated lumber must be thoroughly swabbed with 2 applications of copper napthenate.

Fire Retardant Treatment: Fire retardant treatment must be paintable, odorless fire retardant preservative applied by pressure treating methods.

99-06100C Construction

Wood Framing:

Wood framing must comply with Chapter 23 of the California Building Code.

Framing members must be of sizes and spacing shown. Unless otherwise shown, structural members must not be spliced between supports.

Wood framing must be accurately cut and assembled to provide closely fitted members. Framing must be erected true to the lines and grades shown and must be rigidly secured in place as shown and as required by recognized standards. Bracing must be placed wherever necessary to support all loads on the structure during erection.

The size and spacing of fasteners and the edge distance for nails must be as shown.

Nailing schedule must be as shown and must comply with the California Building Code.

Wall coverings exposed to the weather must have a backing of building paper applied weatherboard fashion to the framing or sheathing. Backing must be lapped 2 inches at horizontal joints, 6 inches at vertical joints and 12 inches at building corners.

Stair Framing:

Stair framing members must be of the size and spacing shown.

Stringers must be notched to receive treads, risers and supports. Effective depth remaining must be not less than 3½ inches.

Plywood Panels:

Plywood panels must be attached to the framing as described. All structural plywood sheathing (both roof and wall) must be nailed with "Common" nails.

Plywood decking must be glued and nailed to the framing system.

Plywood sheathing must be nailed to the framing system and must be continuous over 2 or more supports. Roof and floor panels must be installed with the long dimension across the supports, with end joints staggered 4 feet. Wall sheathing must have all edges blocked. Spacing between panels must be 1/8 inch.

99-06100D Payment

Not Used

99-06194 PREFABRICATED WOOD I-BEAM JOISTS

99-06194A General

99-06194A(1) Summary

Scope: This work consists of designing, fabricating, and erecting pre-engineered, factory fabricated wood I-beam joists.

99-06194A(2) Definitions

Not Used

99-06194A(3) Submittals

Shop Drawings:

Complete shop drawings, erection drawings, if required, and design calculations for the pre-engineered I-beam joists, permanent bracing and connection details must be submitted. Submittals must be authorized before the start of fabrication.

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

Shop drawings must show the lumber and plywood sizes, species and grades for joist flanges and webs and for temporary and permanent bracing members. Joint and connection details must be shown.

Shop drawings must include a location plan which shows the location and identification of each joist.

Calculations for the design of the joists, bracing, and connections must include a list of applied loads and load combinations with the resulting member forces and member stresses.

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.

99-06194A(4) Quality Control and Assurance

Codes and Standards: I-beam joists and permanent bracing must be designed for the loads shown. The design must comply with the CBC, the "National Design Specification for Wood Construction" by the American Forest and Paper Association, and the "Timber Construction Manual" by the American Institute of Timber Construction (AITC). Joist trusses must be ICC approved.

99-06194A(5) Delivery, Storage, and Handling

I-beam joists must be transported and handled in such a manner as to prevent damage due to warping, distortion and moisture. Joists must be stored off the ground.

99-06194B Materials

99-06194B(1) General

I-beam Joists: I-beam joists must be factory fabricated, pre-engineered I-beam joists, with solid sawn or laminated wood flanges and plywood or oriented strand board (OSB) webs. Joists must be sized to fit the location shown. Lumber sizes, and lumber species and grades must be as shown on the authorized shop drawings. Lumber and plywood must bear grade marks of a recognized grading association and the moisture content of the lumber must be within the amount specified in the referenced specifications.

Connectors and Fasteners: Connectors and fasteners must be as shown on the authorized shop drawings.

99-06194B(2) Fabrication

Joists and bracing members must be accurately cut to provide tightly fitted joints and connections.

Camber, if required by the design, must be built into the joists.

Each joist must be stamped or marked with a location identification mark or symbol and with the name and address of the manufacturer.

99-06194C Construction

Joists must be erected plumb and true and must be secured rigidly in place under the joist manufacturer's instructions.

Nails and other fasteners must be placed as shown and as instructed by the manufacturer.

Bracing must be installed during erection to hold the joists plumb and true and in a safe position until sufficient permanent construction is in place to provide full stability.

All permanent bracing must be secured in place before any sustained permanent loads are applied to the joist system.

Materials loaded on the joist system must be located in such a manner to insure that the design load is not exceeded in the area of placement of the materials.

99-06194D Payment

Not Used

99-06200 FINISH CARPENTRY

99-06200A General

99-06200A(1) Summary

Scope: This work consists of installing materials and performing finish carpentry, including exterior and interior trim, plywood soffits and panels and plywood and softwood paneling.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

99-06200A(2) Definitions

Not Used

99-06200A(3) Submittals

Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples: One sample must be submitted to the Engineer at the job site for each species and cut or pattern of finish carpentry as shown below:

Exterior standing and running trim: 2 feet long by full board or molding width, finished on one side and one edge.

Interior standing and running trim: 2 feet long by full board or molding width, finished on one side and one edge.

Siding: 2 feet long, finished on one side and one edge.

Exterior plywood for transparent finish: 2 feet long by panel width, finish must be applied to upper half of each piece.

Plywood paneling: 2 feet long by full panel width, finished on one side.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials – Composite Wood and Agrifiber Products: Submit product data for composite wood and agrifiber products (particleboard, medium density fiberboard, plywood, wheatboard, strawboard, panel substrates, and door cores) to be used inside building weatherproofing system, indicating no added urea formaldehyde in resins or laminating adhesives.

99-06200A(4) Quality Control and Assurance

Factory Marks: Each piece of lumber and plywood must be marked with type, grade, mill and grading agency identification. Marks must be omitted from surfaces to receive transparent finish. A mill certificate stating that material has been inspected and graded complying with the requirements must be furnished if marks cannot be placed on concealed surfaces.

Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with California Green Building Code limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials - Composite Wood and Agrifiber: Provide composite wood and agrifiber products which contain no added urea formaldehyde resins in materials or laminating adhesives. Composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores. Furniture and fixtures are not included in this credit.

99-06200A(5) Delivery, Storage, and Handling

Delivery: Carpentry materials must be delivered after painting, wet work and similar operations have been completed.

Protection: Finish carpentry materials must be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

99-06200B Materials

Softwood Lumber: Softwood lumber must comply with PS 20, "American Softwood Lumber Standard," with applicable grading rules of inspection.

Plywood: Plywood must comply with Voluntary Product Standard PS 1, "Structural Plywood," or its predecessor, "Construction and Industrial Plywood."

Hardwood Lumber: Hardwood lumber must comply with the National Hardwood Lumber Association (NHLA) rules.

Woodworking: Woodworking must comply with WI "Architectural Woodwork Standards," custom grade

Lumber sizes indicated must be nominal sizes except as indicated by detailed dimensions. Lumber which is to be dressed or worked and dressed must be manufactured to the actual sizes as required by PS 20.

Lumber that is to receive a transparent finish (stained or clear) must be made of solid lumber stock.

Lumber that is to be painted may be solid or glued-up lumber at the contractor's option.

Glued-up lumber for exterior finish work must comply with ASTM D 2559 for "wet use" and be so certified by the inspection agency.

Exterior Standing and Running Trim:

Standing and running trim in the form of boards or worked products must be clear, all heart Redwood.

Trim to be painted must be finished smooth.

Trim which is to be exposed to view and to receive transparent finish (stained or clear) must be saw textured.

Plywood Siding for Transparent Finish: Plywood for transparent finish must be 5/8-inch, redwood, APA RATED SIDING 303-6-W, EXT with exterior glue, rough sawn Texture 1-11. Siding must be factory treated with the manufacturer's standard water repellent preservative.

Plywood Paneling and Wainscoting: Plywood paneling and wainscoting must be APA Interior Grade A-C, Group 1, Exposure 1 plywood. Thickness must be as shown.

Interior Standing and Running Trim:

Standing and running trim to be painted must be paint-grade pine, solid stock or finger jointed.

Standing and running trim to have transparent finish must be solid hardwood, species to be shown.

Stair Treads:

Exterior stair treads must be S4S, vertical grain stadium seat stock redwood.

Interior stair treads must be S3S, C and better grade Douglas fir stepping.

Stair Risers:

Exterior stair risers must be S4S, select heart structural redwood.

Interior stair risers must be S4S, No. l grade Douglas fir.

Railings:

Exterior railings must be S4S, Select heart structural redwood.

Interior railings must be S4S, No. 1 grade Douglas fir.

Open Shelving: Open shelving must be ¾-inch Grade A-C fir plywood with veneer core and ½-inch thick solid stock pine edge banding glued and nailed.

Miscellaneous Materials:

Nails, screws and other anchoring devices of the type, size, material and finish required must be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use and for use with preservative treated wood must be hot dip galvanized.

Screens for soffit vents must be 4 x 4 or 8 x 8 mesh, galvanized screen. Open area must be not less than 50 percent.

Preservative Treatment:

Preservative treatment must be copper napthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

Wood members, except those of redwood, in contact with mortar setting beds, concrete block walls, slab on grade and other concrete work, and wood used for roofing cant and curbs must be pressure treated with leach resistant preservative. Each piece of pressure treated lumber must bear the AWPA label.

All holes, daps, or cuts made after treating must be thoroughly swabbed with copper napthenate.

Fire Retardant Treatment: Fire retardant treatment must be paintable, odorless fire retardant preservative applied by pressure treating methods.

99-06200C Construction

99-06200C(1) Installation

All work must be installed plumb, level, and true with no distortions.

Standing and Running Trim:

Standing and running trim must be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Exterior joints must be made water-resistant by careful fitting.

Anchor Finish Carpentry:

Finish carpentry must be anchored to framing or blocking built in or attached directly to the substrate.

Interior carpentry must be attached to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing where required for complete installation. Fine finish nails must be used for exposed nailing, countersunk and filled flush with finished surface and matching final finish where transparent finish is indicated.

Finish exterior siding must be fastened with corrosion resistant nails. The size and spacing of the siding fasteners must be as shown. Nails must be driven flush with the surrounding surfaces, not countersunk. Nails must be located in the grooves of grooved siding whenever possible.

99-06200C(2) Adjustment, Cleaning, Finishing, and Protection

Damaged and defective finish carpentry work must be repaired or replaced.

All exposed or semi-exposed surfaces must be cleaned.

Finish carpentry must be finished under section 99-09900.

99-06200D Payment

Not Used

99-06414A CABINETS

99-06414A General

99-06414A(1) Summary

Scope: This work consists of installing a swinging gate, wood cabinets and plastic laminate tops, and splashes and returns.

99-06414A(2) Definitions

Not Used

99-06414A(3) Submittals

Product Data: Manufacturer's product data for plastic laminates and cabinet hardware must be submitted.

Samples: Three samples must be submitted for each of the items shown below:

Lumber with or for transparent finish: 6 inches x 3/4 inch x 18 inches, finished on one side and one edge.

Wood veneer faced panel products, with or for transparent finish, finished, 8 inches x 10 inches.

Plastic laminate, 8 inches x 10 inches for each type, color, pattern and surface finish.

Shop Drawings: Shop drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices, and other components must be submitted. Shop drawings must bear the "WI Certified Compliance Label" on the first sheet of the drawings.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials – Composite Wood and Agrifiber Products: Submit product data for composite wood and agrifiber products (particleboard, medium density fiberboard, plywood, wheatboard, strawboard, panel substrates, and door cores) to be used inside building weatherproofing system, indicating no added urea formaldehyde in resins or laminating adhesives.

Certificates of Compliance:

Prior to delivery to the job site, the cabinet manufacturer must submit a WI Certified Compliance Certificate 1) indicating the products that will be furnish for this job and 2) certifying that they will fully meet all the requirements of the grade or grades specified.

WI Certified Compliance Label must be stamped on all cabinet work and swinging gates.

Each plastic laminate top must bear the WI Certified Compliance Label.

Prior to completion of the contract, a WI Certified Compliance Certificate for Installation must be delivered to the Engineer.

99-06414A(4) Quality Control and Assurance

Codes and Standards: Cabinets and swinging gates must be manufactured and installed in under the "Architectural Woodwork Standards" of the Woodwork Institute (WI) requirements for the grade or grades specified or shown.

Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials - Composite Wood and Agrifiber: Provide composite wood and agrifiber products which contain no added urea formaldehyde resins in materials or laminating adhesives. Composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores. Furniture and fixtures are not included in this credit.

99-06414A(5) Delivery, Storage, and Handling

Protection: Cabinets must be protected during transit, delivery, storage and handling to prevent damage, soiling, and deterioration.

99-06414B Materials

99-06414B(1) Acceptable Manufacturers

Manufacturers: High pressure decorative laminates must be Wilsonart; Formica Corp.; Nevamar Corp.; or equal.

99-06414B(2) Manufactured Units

Cabinets must be fabricated to the dimensions, profiles, and details shown with openings and mortises precut, where possible to receive hardware and other items and work.

Fabrication, assembly, finishing, hardware application, and other work must be completed to the maximum extent possible prior to shipment to the job site.

Wood Cabinets for Transparent Finish: Wood cabinets for transparent finish must be custom grade, exposed face frame construction. Unless otherwise shown, exposed surfaces must be natural birch. Wood for semi-exposed surfaces must match the wood for exposed surfaces.

Wood Cabinets for Opaque Finish: Wood cabinets for opaque finish must be custom grade, exposed face frame construction. Exposed and semi-exposed surfaces must be any close grained hardwood.

Laminate Clad Cabinets:

Laminate clad cabinets must be custom grade, flush overlay construction.

Laminate cladding must be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish must be as shown. Laminate surface and grade must be as follows:

1. Horizontal and vertical surfaces other than tops must comply with NEMA LD 3, general purpose grade GP-50 (50-mil nominal thickness).
2. Postformed surfaces must comply with NEMA LD 3, postformed grade PF-42 (42-mil nominal thickness).

Laminated Counter Tops and Splashes:

Laminated counter tops and splashes must be WI custom grade.

Surface material must be high pressure laminated plastic complying with NEMA LD-3, 50-mil thickness.

Unless otherwise shown, splashes must be 4 inches high from the surface of the deck. Back splashes must be continuous formed and coved. Side splashes must be top set.

Laminated counter tops must be self edged. Counter tops to receive sinks or plumbing fixtures must have a bullnose.

The underside of tops and backsides of splashes must be covered with an authorized backing sheet.

Swinging gate: Swinging gate must comply with WI “Custom” grade, solid core wood door. Faces must be paint grade hardwood veneer.

99-06414B(3) Cabinet Hardware and Accessory Materials

Cabinet hardware and accessory materials must be provided for cabinets.

Hardware must be provided with standard US 26 metal plated finish or BHMA 625 sprayed finish where indicated.

Drawer Slides: Drawer slides must be side mounting full extension with fully enclosed rolling balls and rollers, concealed slides and bearings, and positive stop. Capacity must be not less than 75 pounds, except capacity must be not less than 100 pounds for heavy duty drawers.

Door Guides: Sliding door guides must be continuous, dual channel, metal guides, top and bottom. Bottom guide must have crowned track.

Shelf Supports: Shelf supports must be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet Hinges:

Cabinet hinges must be steel. Length of jamb leaf must be 2½ inches. The type of hinge must be as shown.

Cabinet hinge manufacturers must be Stanley, Hager, McKinney, or equal.

Cabinet Catches:

Cabinet catches must be self aligning magnetic type in aluminum case with zinc plated steel strike.

Cabinet catch manufacturers must be Stanley, Hager, McKinney, or equal.

Cabinet Pulls:

Cabinet pulls must be 5/16-inch diameter rod, with 1 5/16-inch projection and 4-inch center to center fastening.

Cabinet pull manufacturers must be Stanley, Hager, McKinney, or equal.

Cabinet Knobs:

Cabinet knobs must be cast brass with plated finish, must be one-inch diameter with ¾-inch projection.

Cabinet knobs manufacturers must be Stanley, Hager, McKinney, or equal.

Swinging Gate Hardware:

Swinging gate hardware must consist of spring pivot, bolt type latch, and wall bumper.

Spring pivot must be mortise ball bearing pivot with adjustable spring tension and flat jamb gate brackets.

Wall bumper must be not less than 2½ inches in diameter with a one-inch projection.

99-06414B(4) Shop Fabrication

Shop Assembly:

Nails must be countersunk and the holes filled, molds must be neatly mitered and all joints must be tight and true.

As far as practicable, work must be assembled at the mill and delivered to the building ready to be set in place. Parts must be smoothly dressed and interior work must be belt sanded at the mill and hand sanded at the building. After assembly, work must be cleaned and made ready for the specified finish.

Veneer sequence matching must be maintained for cabinets with transparent finish.

All work must be prepared to receive finish hardware. Finish hardware must be accurately fitted and securely fastened as instructed by the manufacturer. Finish hardware must not be fastened with adhesives.

Drawers must be fitted with dust covers of ¼-inch plywood or hardboard above compartments and drawers except where located directly under tops.

Precut Openings: Openings for hardware, appliances, plumbing fixtures, and similar items must be precut where possible. Openings must be accurately located and templates used for proper size and shape. Edges of cutouts must be smoothed and edges sealed with a water-resistant coating.

99-06414C Construction

Cabinets: Cabinets must be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware must be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items must be completed as indicated on the authorized drawings.

Laminate Tops: Laminate tops must be securely fastened to base units and other support systems as indicated on the authorized drawings.

Cabinet Hardware:

Doors for cabinets must be equipped with one pair of hinges and one catch per leaf, unless otherwise shown. Each door leaf must be equipped with one pull.

Drawers up to 24 inches wide must have one pulland drawers over 24 inches wide must have two pulls.

99-06414D Payment

Not Used

99-7 THERMAL AND MOISTURE PROTECTION

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.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

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."

Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

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 unfacedbatts in walls and ceilings, acoustical batts for sound control, 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 E84 (CBC,Sec.720)

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

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-19 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation must comply with ASTM C 665, Type II, Class C.

Acoustical Insulation: Acoustical insulation must be 3½ inches, unfaced fiberglass insulation batts. Insulation must comply with ASTM C 665, Type I.

Exposed Insulation:

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

99-07214 RIGID WALL INSULATION

99-07214A General

99-07214A(1) Summary

Scope: This work consists of installing rigid wall insulation.

Rigid insulation includes rigid insulation, wood nailers, fasteners, and other materials which are required for the complete installation of the rigid insulation system.

99-07214A(2) Definitions

Not Used

99-07214A(3) Submittals

Not Used

99-07214A(4) Quality Control and Assurance

Codes and standards: Rigid foam insulation must have a flame- spread rating not to exceed 75 and a smoke density not to exceed 450 when tested under ASTM E-84. Rigid foam insulation must comply with

CBC section 720 and chapter to be installed exposed, or without a thermal barrier on the room side of the insulation.

99-07214B Materials

Rigid insulation: Rigid insulation must be rigid rectangular boards of polyisocyanurate foam with aluminum foil facing on both sides and an aged thermal resistance of R- 12, complying with ASTM Designation: C 1289, Type I, Class 1 or 2. Facing on exposed insulation must be white tinted aluminum foil.

Wood nailers: Wood nailers must be Douglas fir, Hem-fir or equivalent western softwood. Nailers in contact with masonry or concrete must be pressure treated after fabrication. Wood preservatives must be waterborne type.

Insulation tape: Insulation tape must be as recommended by the insulation manufacturer.

Adhesive: Adhesive must be construction grade panel adhesive as recommended by the insulation manufacturer, complying with VOC requirements.

PVC strips: PVC strips must be interlocking male and female white PVC strips.

Fasteners: Fasteners must be concrete nails; Bostich, Pneumatic Nail System; Buildex, Tapcon Fasteners; or equal.

99-07214C Construction

Installation of rigid insulation:

The preparation of the wall surfaces and the installation of insulation must comply with the manufacturer's instructions and as described herein.

Rigid insulation placed behind plywood or gypsum board must be tight fitting between nominal 2" x 4" wood nailers laid flat and spaced 2 feet on center. Wood nailers must also be placed at the top and bottom of the plywood or gypsum board.

Exposed rigid insulation must be installed tight fitting between PVC strips spaced at 4 feet on center. PVC strips must align with the vertical joints of the plywood below. Adhesive must be applied to the PVC strips and the wall as instructed by the insulation manufacturer. Exposed insulation must have no horizontal joints between the top of the plywood and the bottom of the trusses.

All joints between insulation boards and between insulation boards and wood nailers must be taped.

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.

99-07214D Payment

Not Used

99-07215 SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and applying a cementitious, sprayed-on fireproofing to structural members in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data:

Manufacturer's descriptive data and application instructions shall be submitted for approval.

Descriptive data shall include trade names, manufacturers' names, complete information on the materials to be applied, the material thickness for columns and beams for the required fire resistance ratings, and the manufacturer's printed instructions for application.

QUALITY ASSURANCE

Codes and Standards: Sprayed-on fireproofing shall have a maximum flame spread rating of 10, and smoke development of 0 in accordance with ASTM Designation: E 84.

Single Source Responsibility: Fireproofing materials shall be purchased from a single supplier.

Certificates of Compliance: Certificates of Compliance shall be furnished for sprayed-on fireproofing materials in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING

Materials to be applied shall be delivered in original unopened packages. Packages shall be identified by the manufacturer's label and shall bear proper UL or FM labels for fire resistance classification.

Materials shall be stored above ground, under cover, and in a dry location until ready for use. Packages which have been exposed to moisture before use shall be discarded.

PART 2 - PRODUCTS

Fireproofing: Fireproofing shall be sprayed on cementitious or mineral fiber fireproofing conforming to ASTM Designation: E 119.

Fireproofing Primer and Adhesive: Fireproofing primer and adhesive shall be as recommended by the fireproofing manufacturer.

PART 3 - EXECUTION

Preparation:

Surfaces to be fireproofed shall be clean and dry, and shall be free from rust, grease, dust, and other deleterious materials which could impair the bond of the fireproofing.
Prior to applying fireproofing, clips, hangers, support sleeves and other attachments required to penetrate the fireproofing shall be in place.
Ducts, piping, equipment or other suspended matter which would interfere with the application of fireproofing materials shall not be positioned until fireproofing work is completed.
Surfaces not to receive sprayed on fireproofing shall be protected from the overspray of the fireproofing materials.

Application:

Equipment and application procedure shall be as recommended by the fireproofing manufacturer.
The primer and fireproofing materials shall be applied in accordance with the fireproofing manufacturer's application instructions.
The final wet film thickness of sprayed on fireproofing materials shall be as required to achieve the fireproofing manufacturer's specified resistance rating.
The material thickness shall be measured on the basis of the wet film thickness and shall be determined by random measurements during application.
Patching and repairing of sprayed on fireproofing shall be done by spraying or hand troweling.

Clean-up: Work areas shall be maintained in an orderly condition. Upon completion of the installation, all debris and equipment shall be removed from the job site.

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

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.

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

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 5.6 per inch (26.8 total R value as installed) and compressive strength of at least 16 psi.

Cover Board:

Plywood 5/8 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 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.

Additional layers of insulation must be secured with adhesive complying with the manufacturer's instructions.

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.

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

99-07411 METAL ROOFING

99-07411A General

99-07411A(1) Summary

Scope: This work consists of installing preformed metal roofing.

Metal roofing system consists of underlayment, prefinished metal roof panels, gutters, downspouts, concealed fasteners, sealants, snow guards, and other accessories and components required for a complete, securely fastened, and weathertight installation.

99-07411A(2) System Description

Design Requirements: The roofing system must comply with the wind design requirements for uplift in 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.

99-07411A(3) Definitions

Not Used

99-07411A(4) Submittals

Product Data:

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

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

Samples:

Material samples must include a 12 inch x 12 inch sample of the roofing panel 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 metal roofing must be submitted.

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

Design calculations for the fastening system with the substrate shown 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.

Submit product data for roof covering surface materials indicating solar reflectance index (SRI), initial thermal emittance, and initial solar reflectance.

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

99-07411A(5) Quality Control and Assurance

Provide roofing materials for building roofs with a solar reflectance index of at least 78 for low-sloped roofs (slope 2:12 or less) and at least 29 for steep-sloped roofs (slope greater than 2:12), and comply with Cool Roof Regulations.

99-07411A(6) Delivery, Storage, and Handling

Delivery and Handling: Panels must be protected against damage and discoloration.

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

99-07411B Materials

99-07411B(1) Sheet Material

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 AZ55 [AZM 165], coating extra smooth.

Configuration: Metal roofing system must be batten roofing system. Battens may be snap-on or integral to the roofing panel. Panel edges at batten must stand a minimum of one inch high. Battens must be a minimum of 1¾ inches high and spaced not less than 12 inches nor more than 18 inches on center.

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

Configuration: Metal roofing system must have primary vertical ribs spaced at not less than 8 inches nor more than 12 inches, with 2 intermediate ribs located between the primary ribs. The depth of the primary ribs must be between ¾ inch and 1 5/8 inches in depth.

99-07411B(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 Architect 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.

99-07411B(3) Miscellaneous Metal Shapes

Flashings, Gutters, and Downspouts: Flashings, gutters, and downspouts must be formed from the same material, gage and in the same finish as the roofing panels.

Perforated Soffit: Perforated soffit must be formed from the same material, gage and in the same finish as the roof panels.

99-07411B(4) Miscellaneous Materials

Fastener Clips: Fastener clips must be noncorrosive ferrous metal fasteners as recommended by the metal roofing system manufacturer to resist the design loads.

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

Underlayment: Underlayment must be as recommended by the metal roofing 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 as recommended by the roofing manufacturer.

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

99-07411B(5) Shop Fabrication

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

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

99-07411C Construction

99-07411C(1) Installation

Underlayment: The roof and fascia 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 Panels:

The roof system must be installed and fastened complying with 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 roofing system manufacturer.

Roof 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.

Gaskets, joint fillers, sealants and sealing tape must be installed where indicated on the authorized drawings or as required for weatherproof performance of panel systems.

Fasteners must be concealed and must not be driven through roof panels or batten covers.

Miscellaneous Metal Shapes:

Trim, fascia, flashings, gutters, downspouts, scuppers, 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 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.

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

Gutters and downspouts must be fabricated by the metal roofing system manufacturer to the shape and lengths shown. Expansion joints must comply with the manufacturer's instructions and to SMACNA "Architectural Sheet Metal Manual."

The metal roofing 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.

99-07411C(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.

99-07411D 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, gutters, downspouts, roof jacks, gravel stops, reglets, copings, scuppers, conductor heads, and screen type vents.

Alternatives: Premolded roof flashings may be used in lieu of sheet metal flashings where shown or required.

99-07620A(2) Definitions

Not Used

99-07620A(3) Submittals

Not Used

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."

Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

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 Metal for Green Roof Counterflashings: Counterflashings and reglets at green roof must be prefinished stainless steel sheet or prefinished galvanized steel sheet. Finish must be polyvinyl chloride (PVC) or fluoropolymer containing at least 70% resin by weight.

Stainless Steel Sheet: Stainless steel sheet must comply with ASTM A 240 or A 666, Type 304, dead soft, fully annealed.

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.

Premolded Roof Flashing: Premolded flashing must be polyvinyl chloride (PVC) flashing, designed for heat welding to PVC roof membrane.

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.

Roof counterflashings must consist of separate reglet and counterflashing pieces for ease of removal during maintenance or testing.

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.

On built-up roofing, 2 flashings must be furnished for each pipe, vent or flue through roof. Flashings must be constructed so that the lower flashing must sit directly on the roof deck, with the top flashing set over it on top of the roof felts.

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.

Hung Gutters:

Hung gutters must be fabricated from galvanized sheet steel, not less than 24-gage. Gutters must be size and shape as shown.

Gutters must be fabricated in sections not less than 10 feet in length. Use sections as long as practicable for lengths over 10 feet.

Joints must be lapped at least 1½ inches, rivet and solder watertight. Butt type expansion joints, ¾ inch wide, must be provided at midpoint between down spouts and where expansion joints occur in the structure.

Downspouts:

Downspouts must be fabricated from galvanized sheet steel, not less than 24-gage. Size and shape must be as shown.

Downspouts must be installed as shown, secured to the wall with straps near top, bottom and at intermediate points not more than 8 feet apart. Straps must extend 2 inches out on wall and be secured with suitable anchors.

Unless otherwise shown, the lower end of downspout must terminate with mitered 45 degree elbow.

Premolded Roof Flashings: Premolded roof flashings must be installed under the manufacturer's instructions.

99-07620D Payment

Not Used

99-07720 ROOF SPECIALTIES

99-07720A General

99-07720A(1) Summary

Scope: This work consists of installing roof specialties.

Roof specialties include hatch-type heat and smoke vents, dome-type heat and smoke vents, roof hatches, prefabricated ridge ventilators, and prefabricated curb and equipment support units.

99-07720A(2) Definitions

Not Used

99-07720A(3) Submittals

Product Data: Manufacturer's descriptive data, rough-in diagrams, installation instructions, and general product recommendations must be submitted.

Samples: Two samples, minimum 8 inches square, of each exposed metal and plastic sheet materials, and 2 samples, minimum 24 inches long, of formed or extruded metal member each color and finish specified must be submitted.

Coordination Drawings: Coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping or conduit, must be submitted. Drawings must indicate dimensions and locations of items provided, together with relationship and methods of attachment to adjacent construction and to mechanical and electrical items.

99-07720A(4) Quality Control and Assurance

Labels: Units must be provided which have been tested, listed, and bear the label of UL, FM or other recognized testing agency.

Codes and Standards: Prefabricated units must comply with the requirements of SMACNA, "Architectural Sheet Metal Manual," details for fabrication of units, including flanges and cap flashing to coordinate with types of roofing involved.

99-07720B Materials

99-07720B(1) General

Manufacturer's standard units, modified as necessary, must be provided to comply with the contract requirements. Each unit must be shop fabricated to the greatest extent possible.

Sheet Steel: Sheet steel must be structural quality complying with the requirements of ASTM A 570.

Galvanized Sheet Metal: Galvanized sheet metal must be commercial quality, complying with ASTM A 446, G90 hot dipped galvanized, and mill phosphatized.

Stainless Steel: Stainless steel must comply with ASTM A 167, Type 302/304, with annealed finish. Stainless steel must be tempered as required for forming and performance.

Aluminum Sheet: Aluminum sheet must comply with the requirements of ASTM B 209, tempered as required, anodized finish, except furnish mill finish where field painting is required.

Extruded Aluminum: Extruded aluminum must be the manufacturer's standard extrusions of sizes and profiles required, clear anodized finish unless otherwise shown.

Insulation: Insulation must be the manufacturer's standard rigid or semi-rigid board of glass fiber and must be the thickness required.

Wood Nailers: Wood nailers must be softwood, pressure treated with copper napthenate, pentachlorophenol, or water-borne arsenicals (ACA, CCA or ACZA); not less than 2-inch nominal thickness.

Fasteners: Fasteners must be the same metal as the metal to be fastened, or other non-corrosive metal as recommended by the unit manufacturer. Finish of the fastener must be the same finish as the metal being fastened.

Bituminous Coating: Bituminous coating must be as recommended by the unit manufacturer for the use specified.

Gaskets: Gaskets must be tubular or fingered design of neoprene or polyvinyl chloride as recommended by the unit manufacturer.

99-07720B(2) Prefabricated Heat/Smoke Vents

Not Used

99-07720B(3) Prefabricated Roof Hatches

Not Used

99-07720B(4) Prefabricated Roof Ventilator

Not Used

99-07720B(5) Prefabricated Curb and Equipment Supports

Curb and equipment support must comply with the loading and strength requirements of the equipment to be supported. Dimensions must comply with the dimensions shown on the coordination drawings of equipment to be supported. Unit must be fabricated from sheet steel complying with ASTM A 570 and galvanized after fabrication.

Units must be fabricated with welded or sealed mechanical corner joints, complete with cant strips and base profile coordinated with roof insulation thickness. Wood nailers must be provided at top of curb tapered as necessary to compensate for roof slopes of 2%.

Where roof slope is more than 2%, curb or equipment supports must be fabricated with height tapered to provide a level installation.

99-07720C Construction

99-07720C(1) Installation

Prefabricated units must be installed under the manufacturer's instructions and authorized coordination drawings.

Installation of the units must be coordinated with installation of the roof decking and other substrates to receive accessory units, vapor barriers, insulation, roof and flashing materials.

Units must be securely fastened to supporting members, adequate to withstand all lateral, inward or outward loading pressures.

Where metal surfaces are to be installed in contact with non-compatible metals or other corrosive substrates, including wood decking, bituminous coatings must be applied to metal surfaces.

Except as noted above, roof flanges must be set in a thick bed of roofing cement to form a watertight seal.

Operational Testing: Units with operational components must be fully tested. Joints and hardware must be cleaned and lubricated. All units must be adjusted for proper operation.

99-07720C(2) Cleaning and Protection

All exposed metal and plastic surfaces must be cleaned under the manufacturer's instructions. Damaged metal coatings must be repaired.

99-07720D Payment

Not Used

99-07910 JOINT SEALANT

99-07910A General

99-07910A(1) Summary

Scope: This work consists of preparing and placing a joint sealant.

The sealed joint consists of tempered hardboard, expanded polystyrene, and a pourable joint seal.

99-07910A(2) Definitions

Not Used

99-07910A(3) Submittals

Product Data: Manufacturer's descriptive data, specifications, and installation instructions must be submitted.

> Low-Emitting Materials - Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-07910A(4) Quality Control and Assurance

Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-07910B Materials

Tempered Hardboard: Tempered hardboard must be 1/8-inch minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

Expanded Polystyrene: Expanded polystyrene must be commercially available polystyrene board.

Polyethylene Foam: Polyethylene foam must be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

Primer: Primer must be as recommended by the sealant manufacturer.

Joint Sealant: Joint sealant must be a commercial quality, 2 component polyurethane sealant, which must be self-levelling and withstand up to 25 percent movement.

99-07910C Construction

99-07910C(1) Preparation

Forming:

Groove for joint seal must be formed to a uniform width and depth and to the alignment shown or as ordered by the Engineer. The completed groove must have a top width within 1/8 inch of the width shown and the bottom width must not vary from the top width by more than 1/16 inch.

At least 24 hours prior to installing the joint seal, the Contractor must repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint must be beveled by grinding as shown.

Cleaning:

Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage, and all foreign material must be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint must be cleaned by a method which must include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

99-07910C(2) Installation

Materials:

No material must be used which has skinned over or which has settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.

Each container of material must be clearly labeled or each delivery of material in the tanks of 2-component equipment must be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, and date, if any, beyond which the sealant must not be used.

Primer: A primer must be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer must be dry at the time of placing the sealant. Contaminated primer must be removed and replaced.

Joint Sealant: The 2-component sealant must be mixed and placed in the groove under manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, must not be used.

99-07910D 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.

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

99-07920A(2) Definitions

Not Used

99-07920A(3) Submittals

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

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

Compatibility and Adhesion Test Reports:

> Submit evidence that materials forming joint substrates and joint sealant backings have been tested for compatibility with and adhesion to joint sealants.
>
> Submit interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
>
> Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

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.
>
> Low-Emitting Material - Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

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 SonnebornSonolastic 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.

Fire-Rated Door Assembly Product Test Reports: Submit comprehensive tests performed by a NRTL for each type of fire-rated door assembly.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

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.

Fire-Rated Door Assemblies: Furnish assemblies complying with NFPA 80, with all components listed and labeled by a NRTL, for fire-protection ratings shown. Assemblies must be approved by the California State Fire Marshal.

Smoke-Control Door Assemblies: Furnish assemblies complying with UL 1784, with all components listed and labeled by a NRTL. Assemblies must be approved by the California State Fire Marshal. Install assemblies under NFPA 105.

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

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.
4. Where shown, furnish thermally insulated doors fabricated with an overall heat transfer coefficient (U-Factor) of not more than .09.

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.

Grout: Furnish grout complying with ASTM C 476, except with a maximum slump of 4 inches, as measured under ASTM C 143.

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

Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

Jamb Anchors: Unless otherwise shown, 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.

Coordinate installation of frames to allow for solidly filling space between frame and walls with grout or mineral-fiber insulation as shown.

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

99-08520 WINDOWS

99-08520A General

99-08520A(1) Summary

Scope: This work consists of installing windows.

99-08520A(2) Definitions

CSA: Canadian Standards Association.

WDMA: Window and Door Manufacturers Association.

99-08520A(3) Submittals

Submit manufacturer's descriptive data, installation instructions, and schedule. Submit the manufacturer's color palette for finish color selection.

Manufacturer's descriptive data and installation instructions must show window elevations, plan views, full size sections, anchoring details to all substrates, anchors, and hardware.

Installation schedule must show location, size, and type for each window.

Product Test Reports: Submit product test reports based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window.

MR Credit 5, Regional Materials: For materials with regional content, submit product data indicating location and radius distance from job site of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the percentage by weight that is considered regional.

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Certificates of Compliance: Submit certificates of compliance for all windows.

99-08520A(4) Quality Control and Assurance

Not Used

99-08520B Materials

99-08520B(1) General

Windows must be Commercial Class aluminum prime windows unless otherwise shown.

Windows must comply with AAMA/WDMA/CSA 101/I.S.2/A440 and must meet C30 or CW30 Performance Class and Grade unless otherwise shown. Windows must bear the AAMA label.

Glazing for windows must comply with section 99-08810.

99-08520B(2) Delivery, Storage, and Handling

Windows must be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description.

Windows and accessories must be stored off the ground, kept dry, and fully protected from weather and damage.

99-08520B(3) Windows

Door and Transom Windows: Door and transom windows must be door or door frame manufacturer's standard window framing, glazing stops, and glazing accessories.

Fixed Windows: Fixed windows must be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

Projected Windows:

Projected windows must be equipped with glazing accessories, replaceable weatherstripping, vent screens, operating handles, and locks on top hinged vents.

One operating pole must be provided for every 10 windows installed 6 feet or more above the floor. The operating pole and window operating handle must be compatible. The bottom of the pole must be no more than 3 feet from finish floor.

Aluminum: Aluminum must be aluminum alloy 6063-T5 complying with ASTM B 221.

Screws, Fasteners, and Window Accessories: Screws, fasteners, and window accessories must be non-corrosive metals compatible with aluminum, except guides may be vinyl and rollers may be nylon. Locks, operators, strikes, keepers, and other metal hardware must match window finish.

Weatherstripping: Weatherstripping must be continuous, replaceable type, wool pile mounted in metal or double runs of ultraviolet resistant neoprene or vinyl.

Vent Screen: Vent screen must be aluminum frame with 18 by 14 mesh aluminum screening and polyvinyl-chloride splines. Screen frames must be removable from the interior. Screen frame must match window finish.

Sealant: Sealant for installation of windows into wall openings must be single-component, polyurethane, self-leveling, non-sag, and must comply with ASTM C 920.

Tape: Tape must be compatible with sealant.

99-08520B(1) Shop Fabrication

Frame and sash must be accurately machined and fitted to hairline joinery that develops the members. Joints must be factory sealed weathertight.

Outward opening vents without roto-type operators must be provided with adjustable sliding friction type hold-open assemblies.

Sash must be removable from the interior only. Sash must have concealed condensation weeps to the outside.

Window finish must be a 2-coat high performance fluoropolymer finish complying with AAMA 2604 and containing 70 percent polyvinylidene fluoride resin.

99-08520C Construction

99-08520C(1) General

Not Used

99-08520C(1) Installation

Window units must be set straight, level, plumb and in true alignment in prepared openings. Windows must be centered in openings. Clearance between the window unit and the building framing must be from 3/16 to 1/4 inches at the sides and 1/2 inch at the top. Ventilator sash must be adjusted after glazing for easy, smooth and proper operation.

The installation must be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials must be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or other material per the window manufacturer instructions and authorized by the Engineer.

99-08520D 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.

Fire-Rated Door Assemblies: Furnish door hardware (1) rated for use, (2) approved by the SFM, and (3) complying with NFPA 80.

Smoke-Control Assemblies: Furnish door hardware (1) rated for use, (2) approved by the SFM, (3) complying with UL 1784, and (4) installed under NFPA 105.

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

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.

Submit details of electrified door hardware, including:

1. Power, signal, and control wiring diagrams. Include conductor numbers.
2. Schematic diagrams of interface of electrified door hardware and building intrusion and security systems.

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

Closeout Documents:

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

Closeoutdocuments 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

Not Used

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-inchbolt throw

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

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

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

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

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

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

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

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

1. Lever: Solid tube with return. Curved with return to be within 1/2"of the door Contour with angled 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

Not Used

99-08710B(5) Electromechanical Locks

Not Used

99-08710B(6) Flush Bolts

Not Used

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

Not Used

99-08710B(8) Surface Closer

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

99-08710B(9) Exit Devices

Not Used

99-08710B(10) Operating Trim

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

99-08710B(11) Protective Trim Unit

Kickplates and Mop Plates: Beveled edges, stainless steel, countersunk screw holes, width 2 inches less than door width for single doors, and 1-inch less than door width each for door pairs. Kickplate must be Type J102, 12 inches tall. Mop plate must be Type J103, 6 inches tall.

99-08710B(12) Mechanical Stops and Holders

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

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

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

99-08710B(13) Door Gasketing

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.

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. Door closer shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

99-08710C(7) Door Hardware Schedule

Furnish hardware sets as specified in the following tables:

DOOR HARDWARE SET 1

No.	Item	Description	Quantity
1	Hinges	Heavy type 5111	3
	Mortise lockset and latch	Exit	1
	Lock cylinder		1
	Surface closer		1
	Mechanical stops and holders	Wall Stop	1
	Gasketing	Manufacturer standard	1
	Threshold		1

DOOR HARDWARE SET 2

No.	Item	Description	Quantity
1	Hinges	Heavy type 8111	3
	Mortise lockset and latch	Passage	1
	Surface closer		1
	Mechanical stops and holders	Floor	1

DOOR HARDWARE SET 3

No.	Item	Description	Quantity
1	Hinges	Heavy type 811	3
	Mortise lockset and latch	Passage	1
	Surface closer		1
	Mechanical stops and holders	Floor	1

DOOR HARDWARE SET 4

No.	Item	Description	Quantity
1	Hinges	Heavy type 511	3
	Mortise lockset and latch	Exit	1
	Surface closer		1
	Mechanical stops and holders	Wall	1
	Gasketing	Bumper-type resilient inserts	1
	Threshold		1

99-08710D Payment

Not Used

99-08810 GLAZING

99-08810A General

99-08810A(1) Summary

Section 99-08810 includes specifications for installing glazing.

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

1. Glass
2. Acrylic sheets
3. Polycarbonate sheets

99-08810A(2) Definitions

SHGC: Solar Heat Gain Coefficient.

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

99-08810A(3) Submittals

99-08810A(3)(a) General

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

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

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

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

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Daylight: Submit product data including visual light transmittance factor for window glazing.

99-08810A(4) Quality Control and Assurance

Not Used

99-08810A(5) Labels

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

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

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

99-08810B Materials

99-08810B(1) General

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

1. Tempered glass must also comply with ASTM C 1048.
1. Heat strengthened glass must also comply with ASTM C 1048.
2. Laminated glass must also comply with ASTM C 1172.

Furnish glass thicknesses specified unless otherwise shown.

Acrylic sheets must comply with ASTM D 4802.

99-08810B(2) Glazing

Float Glass:

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

Float glass thickness must be:

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

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

Ceramic Coated Glass: Ceramic coated glass must comply with ASTM C 1048 Condition B for spandrel glass, and Condition C for vision glass.

Insulating Glass Assemblies:

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

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

The outdoor lite must be clear float glass. The indoor lite must be clear float glass. The glass assembly must have a maximum U-factor of 0.71 for fixed, 0.79 for operable, and a maximum SHGC of 0.73 for fixed, 0.70 for operable.

Bullet Resistant Glass: Bullet resistant glass must have a power rating of "Medium – Small Arms" under UL 752 Level 1, or an equivalent rating under ASTM F 1233, Ballistics Class HG3, "Handgun – Medium, Jacketed." Exterior surface must be mar-resistant. Bullet resistant glass must be one of the following:

1. Laminated glass fused to clear plastic interlayers
2. Laminated polycarbonate sheets
3. Glass-clad polycarbonate complying with ASTM C 1349.

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

99-08810C Construction

99-08810C(1) General

Safety glass must be installed under 24 CA Code of Regs Pt 2 § 2406.

99-08810C(2) Installation

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

Cut edges of tinted glass must comply with the glass manufacturer's instructions. The glazier must inspect each edge of tinted glass. Panes with edges that do not comply with the manufacturer's standards for tinted glass edges for sunny elevations will not be allowed.

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

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

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

Laminated glass must be set on setting blocks.

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

99-08810C(3) Replacement and Cleanup

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

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

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

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

Acrylic sheets must be protected against scuffs, scratches and marring of the surface during construction and any such damaged sheet must be replaced or restored to like new condition. Restoration work must comply with the manufacturer's instructions.

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

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

99-08810D Payment

Not Used

99-9 FINISHES

99-09220 PORTLAND CEMENT PLASTER

99-09220A General

99-09220A(1) Summary

Scope: This work consists of installing lath and applying portland cement plaster.

Plaster must be 3 coat work. The total thickness of plaster must be 3/4 inch unless otherwise shown. The color and the surface finish must be as shown.

99-09220A(2) Definitions

Not Used

99-09220A(3) Submittals

Not Used

99-09220A(4) Quality Control and Assurance

Not Used

99-09220B Materials

Sand: Sand must be lean commercial quality plaster sand.

Cement: Cement must be portland cement, blended hydraulic cement, or portland cement with a maximum of 15 percent mineral admixture. Portland cement must be Type II, complying with ASTM C 150. Blended hydraulic cement must be Type IP, complying with ASTM C 595. Mineral admixture must be Class N, Class F or Class C, complying with ASTM C 618, except loss on ignition must not exceed 4 percent.

Lime: Lime must comply with ASTM C 206.

Color for Plaster: Color for plaster must be non-fading, sunproof, and limeproof fine ground synthetic mineral oxide.

Premixed Portland Cement Plaster: If used, premixed portland cement plaster must be a premixed packaged blend of cement, lime and sand, with or without color, that requires only water to prepare for use as portland cement plaster. Premixed plaster must be proportioned as specified herein. Packages of premix must bear the manufacturer's name, brand, weight and color identification.

Metal Lath: Metal lath must be self-furring expanded metal diamond mesh with rust inhibitive coating and waterproof vapor barrier backing. Mesh must weigh not less than 3.4 pounds per square yard.

Metal Lath Fasteners: Metal lath fasteners must be galvanized or corrosion resistant nails, screws or staples.

Beads, Screeds, Control Joints, and Accessories: Beads, screeds, control joints, and accessories must be galvanized steel, not less than 0.022 inch thick.

Vent Screen: Vent screen must be galvanized sheet steel combination screen and vent with corrosion resistant metal insect screen on the inside.

Water: Water must be potable.

99-09220C Construction

99-09220C(1) Installation

Metal lath, beads, screeds, control joints, vent screens and other metal accessories must be installed rigidly and securely in place under the manufacturer's instructions.

The type, size and spacing of fasteners for fastening the metal lath and accessories must be as recommended by the metal lath manufacturer for the type of substrate and the location of the lath and accessories.

99-09220C(2) Proportioning and Mixing

Materials must be accurately proportioned and measured for each batch. All batches for a given coat must be proportioned the same. Plaster must be proportioned one part cement to between 3 and 5 parts sand by volume, only sufficient water to obtain a workable mix, and a lime plasticizing agent. Not more than 20 pounds of dry hydrated lime or lime putty per sack of cement must be used in the first and second plaster coat. Plaster for finish coat must contain not more than 94 pounds of dry hydrated lime or lime putty per sack of cement. Lime must not be used if mineral admixture or blended hydraulic cement is used.

Frozen materials must not be used in the mix.

All plaster mixing ingredients must be mixed in a mechanical mixer. After all ingredients are in the mixer, the plaster must be mixed for at least 2 minutes. The mixture must be uniform in color after mixing. Hand mixing of plaster will be allowed only with the authorization of the Engineer.

Plaster to be colored must be colored by mixing the coloring ingredient uniformly and homogeneously into the plaster. Color, if used, will be required only in materials for the finish coat.

99-09220C(3) Application

Plaster must not be applied if the ambient temperature is 40 degrees F or less. Plaster must not be applied to frost covered or frozen surfaces. Surfaces to receive plaster must be clean.

The coats of plaster must be applied continuously in one general direction without allowing mortar to dry at the edges.

The first coat must be applied with sufficient material and pressure to form full keys and good bond and to cover surfaces. Before setting, the first coat must be cross-scratched to receive the second coat. The first coat must be moisture cured, without soaking, for at least 48 hours after application or until covered by the second coat.

The second coat of plaster must not be placed until the first coat of plaster has set thoroughly or until at least 12 hours after the first coat of plaster has been placed. The second coat must be brought out to grounds, straightened to a true, even surface, roughened to assure a bond with the finish coat, and made free of imperfections which would reflect in the finish coat. The second coat must be moisture cured, without soaking, for at least 48 hours after application.

The third coat of plaster must not be placed until at least 7 days after the second coat of plaster has been placed. Troweling of the third coat of plaster must leave the surface smooth and free from rough areas, trowel marks, checks, or other blemishes. The finished surface must be true and even and must not vary more than 1/8 inch in 5 feet from the required plane. Plaster with cracks, blisters, pits, stains, efflorescence, shadowing, dryouts, or checks will not be accepted. Surfaces must be clean and sound.

The third coat must have the type of finish shown.

After all other related work has been completed, pointing around trim and set work and repairing of damaged portions of plaster must be done. Repairs and patching must match surrounding work in texture and appearance.

Plaster coats must be protected against freezing for a period of 24 hours after application.

99-09220D Payment

Not Used

99-09250 GYPSUM WALLBOARD

99-09250A General

99-09250A(1) Summary

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

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

99-09250A(2) Definitions

Not Used

99-09250A(3) Submittals

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

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials – Paints and Coatings: Submit product data for paints and coatings to be used on-site and inside the building weatherproofing system, indicating product name, manufacturer's generic description, chemical composition, and VOC content.

99-09250A(4) Quality Control and Assurance

Low-Emitting Material - Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

IEQ Credit 4.2, Low-Emitting Materials - Paints and Coatings: For interior application (inside the weatherproofing system and applied on-site), use wallboard sealers and coatings that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-09250B Materials

99-09250B(1) General

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

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

99-09250B(2) Delivery and Storage

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

99-09250B(3) Gypsum Wallboard

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

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

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

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

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

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

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

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

99-09250C Construction

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

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

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

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

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

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

Adhesives must not be used for securing wallboard to framing.

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

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

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

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

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

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

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

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

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

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

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

99-09250D Payment

Not Used

99-09315 CERAMIC AND QUARRY TILE

99-09315A General

99-09315A(1) Summary

Scope: This work consists of installing ceramic and quarry tile.

Ceramic tile includes glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts, and other materials required for a complete installation.

99-09315A(2) Definitions

Not Used

99-09315A(3) Submittals

Product Data:

Submit manufacturer's descriptive data, a list of materials to be used, and installation instructions.

Submit data for (1) each type of tile, (2) mortar and setting bed materials, (3) bond coat materials and additives, (4) grout materials, and (5) additives.

Submit friction reports for tile products to be used on floors and other pedestrian surfaces.

Samples: Samples must include 2 individual samples of each type and color of tile and trim to be installed and must be of the same size, shape, pattern and finish as the tile and trim to be installed.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials - Flooring Systems: Submit the following:

1. Product data for tile setting adhesives and grout.
2. Certification of compliance for tile setting adhesives and grout with South Coast AQMD rules under IEQ .
3. Test results and certificate of compliance with testing and product requirements of the California Department of Health Services Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

99-09315A(4) Quality Control and Assurance

Single Source Responsibility: Each type and color of tile, grout, and setting materials must be obtained from a single source.

Master Grade Certificates: Each shipment of tile to the job site must include a Master Grade Certificate issued by the tile manufacturer.

Low-Emitting Material - Adhesives and Sealants: For applications inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials - Flooring Systems: Furnish flooring materials with VOC content complying with IEQ Credit 4.1. Comply with local requirements if more stringent.

Low-Emitting Materials - Flooring Systems: Furnish flooring materials which comply with the California Department of Public Health Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

99-09315A(6) Project Conditions

Tile work must be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's instructions.

99-09315B Materials

99-09315B(1) General

Ceramic Tile: Ceramic tile must comply with ANSI A137.1 for types and grades of tile described. Ceramic tile must be Standard Grade.

Tile Installation Materials: Tile installation materials must comply with ANSI A108/A118/A136.1 with products and materials indicated for setting and grouting.

Tile Color and Size: Tile color must be as shown; tile size must be as specified herein.

Slip Resistant Tile: Slip resistant tile must have a static coefficient of friction of not less than 0.6 for walking surfaces and 0.8 for ramps under ASTM C 1028.

99-09315B(2) Delivery, Storage, and Handling

Tile and packaged materials must be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers must bear the Standard Grade label.

Materials must be stored and handled in such a manner to prevent damage or contamination by water, freezing, or foreign matter.

99-09315B(3) Tile Products

Glazed Wall Tile:

Glazed wall tile must be machine made, dust pressed white body clay, plain face with cushion edges and a glossy glaze finish. Tile must be 5/16-inch nominal thickness.

Glazed wall tile trim must match material, size and finish of wall tile. Use bullnose trim on free edges of tiled wall areas. Use bullnose runner trim on outside corners. Do not use beads. Use cove trim on reentrant corners.

Patterned Porcelain Tile:

Patterned porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay. Tiles must have less than 0.5 percent water absorption and be suitable for exterior use. Tiles must be 3/8-inch nominal thickness. Patterned porcelain must be slip resistant.

Tile must have truncated domes, 0.90-inch diameter, 0.20-inch nominal height, with center to center spacing of 2.35 inches. Arrangement of the domes must be such that there is no break in pattern or spacing when tiles are arranged side by side.

Matte Porcelain Tile:

Matte porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay, and plain face. Tile must be 5/16-inch nominal thickness. Matte porcelain tile must be slip resistant.

Matte porcelain trim tile must include cove base at walls and single piece intersecting cove base at corners.

Textured Porcelain Tile: Textured porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay. Tile must have less than 0.5 percent water retention and be suitable for exterior use. Tile must be 5/16-inch nominal thickness. Textured porcelain tile must be slip resistant.

Polished Porcelain Tile: Polished porcelain tile must be machine made, dust pressed natural porcelain clay. Tile must have less than 0.5 percent water absorption and be suitable for exterior use. Tile must have a glossy polished finish and plain face. Tile must be 5/16-inch nominal thickness.

Unglazed Quarry Tile: Unglazed quarry tile must be machine manufactured, plastic made, vitreous hard burned clay, graded shale type tile complying with ANSI A137.1. Tile must be 1/2-inch nominal thickness and must have square edges. Tile must have ribbed backs or such other bonding features authorized by the Engineer.

99-09315B(4) Setting Materials

Materials for portland cement mortar installation must comply with ANSI A108.1 for the installation method described, unless otherwise shown.

Membrane must be a waterproof membrane for ceramic tile installation complying with ANSI A118.10.

Reinforcement must be 2 by 2 inches, W0.3 by W0.3 galvanized welded wire reinforcement complying with ASTM A 185 except for minimum wire size. Reinforcement must be furnished in flat sheets.

Metal lath must be self furring, galvanized, flat expanded type weighing at least 2.5 pounds per square yard and complying with ASTM C 847. Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown.

Tile Bond Coat: Tile bond coat must be latex-portland cement prepackaged mortar mix, incorporating a dry acrylic resin, and complying with ANSI A118.4. Mortar must be suitable for exterior use and be labeled for the type of tile to be placed. Only water must be added to the mortar.

Epoxy Bond Coat: Epoxy bond coat must be a 2 part prepackaged epoxy mortar mix complying with ANSI A118.3 and suitable for exterior use. Mortar must be labeled for the type of tile to be placed.

99-09315B(5) Grouting Materials

Tile Grout: Tile grout must be latex-portland cement prepackaged grout mix, incorporating a dry acrylic resin, and complying with ANSI A118.6. Grout must be suitable for exterior use and be labeled for the type of tile to be placed. Only water must be added to the grout.

Epoxy Grout: Epoxy grout must be a 2 part prepackaged epoxy grout complying with ANSI A118.3 and suitable for exterior use. Grout must be labeled for the type of tile to be placed.

Grout Pigment: Grout pigment must be chemically inert, fade resistant mineral oxide or synthetic type. Color must be as shown.

99-09315B(6) Sealants

Sealant for vertical expansion joints must be a medium modulus silicone or polyurethane. Match color of exposed sealant to grout color in adjoining tile sealed joints.

Sealant for horizontal joints must be a 2-part polyurethane type material with a Shore Hardness of 35 to 45. Match color of exposed sealant to grout color in adjoining tile sealed joints.

99-09315B(7) Mortar Beds

Mortar beds for walls must be proportioned of one part cement, 1/2 part hydrated lime, 6 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients must be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed must be at least 3/4 inch thick.

Mortar beds for floors must be proportioned of one part cement, 1/10 part hydrated lime, 5 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients must be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed must be at least 1-1/4 inch thick.

99-09315B(8) Miscellaneous Materials

Sand: Sand must be a natural or manufactured sand complying with ASTM C 144, except that no more than 10 percent must pass the No. 100 sieve.

Sealers:

Sealers for unglazed quarry tile must be water repellent, clear solution of ammonium cementitious compound, silicone base material, or other commercially manufactured sealer.

Sealers for grout must be a penetrating proprietary compound designed for sealing grout. Silicone sealers must not be used.

Cement: Cement must comply with ASTM C 150, Type I.

Hydrated Lime: Hydrated lime must comply with ASTM C 206, Type S, or ASTM C 207, Type S.

Water: Water must be clean and potable.

Metal Edge Strips: Metal edge strips must be stainless steel terrazzo strips, 1/8 inch wide at the top edge with integral provisions for anchorage to mortar bed or substrate.

Marble Thresholds:

Marble thresholds must comply with ASTM C 503 for exterior use and be abrasion resistance.

Marble threshold must be uniform in color and finish and fabricated to sizes and profiles shown and must provide a smooth transition between tile surfaces and adjoining finished floor surfaces.

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

Shower Pan: Shower pan must be flexible PVC sheeting complying with ASTM D 4551, Grade 40, and manufactured for use as a shower membrane. Solvent cement must be per the manufacturer's instructions.

99-09315C Construction

99-09315C(1) General

Temperatures:

Unless otherwise specified in the manufacturer’s installation instructions, maintain the ambient temperature between 50 and 100 degrees F in tiled areas during installation and for 7 days after completion. Exterior work areas must be shaded from direct sunlight during installation.

Tile must not be installed when the temperature of the substrate is greater than 90 degrees F or is frost covered.

Illumination:Interior work areas must be illuminated to provide the same level and angle of illumination as will be available during final inspection.

99-09315C(2) Preparation

Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed must not vary more than 1/4-inch in 8 feet from the required plane and must be true, plumb at vertical surfaces, and square at intersection edges.

Surfaces to receive a mortar setting bed or a bond coat must be cleaned to assure a tight bond to the applied material. Cleaning must leave the surface thoroughly roughened and free from laitance, coatings, oil, sand, dust and loose particles.

Saturate the cleaned surfaces with water just before placing mortar or coat the cleaned surfaces with fresh neat cement slurry. If the surface is saturated with water, excess water must be removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust must be broomed to completely coat the surface with a thin and uniform coating just before placing the mortar.

Substrates must be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile are installed before beginning placing tile.

99-09315C(3) Mixing

Mixing: Mortar and grout must be mechanically mixed under the referenced standards and manufacturer's instructions to accurately proportion materials and water or additive content. Mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics must comply with the referenced standards and manufacturer's instructions.

99-09315C(4) Schedule

Wall Tile:

Wall tile must be nominal 4 by 4 inch glazed wall tile.

Install tile on mortar bed using a tile bond coat and grout under the *TCNA* Handbook for Ceramic, Glass, and Stone Tile Installation, Method W 222.

Install tile on cementitious backer board using a tile bond coat and grout under the *TCNA* Handbook for Ceramic, Glass, and Stone Tile Installation, Method W 244.

Install tile on concrete and masonry must be on a mortar bed using tile bond coat and grout under the *TCNA* Handbook for Ceramic, Glass, and Stone Tile Installation, Method W 211.

Floor Tile: Floor tile must be nominal matte porcelain tile. Install tile on mortar bed using a tile bond coat and grout under the *TCNA* Handbook for Ceramic, Glass, and Stone Tile Installation, Method F 112.

99-09315C(5) Installation

99-09315C(5)(a) General

Tile installation must comply with applicable portions of ANSI A108/A118/A136.1 and *TCNA* Handbook for Ceramic, Glass, and Stone Tile Installation.

All tile must be installed on a bond coat over a setting bed. The setting bed must be (1) a cured cement mortar bed, (2) a prepared, dimensionally stable substrate of concrete, or masonry, or (3) cementitious backer board or other cementitious material.

The back face of the tile must be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets must have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives must not be used for edge bonding. Temporary mounting materials must allow observation during tile setting operations.

Tile work must extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions unless otherwise shown. Work must be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns must be accurately formed. Cutting and drilling of tile must be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items must be carefully ground to produce straight aligned joints. Tile must be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Cementitious backer board must be installed under ANSI A118.11.

99-09315C(5)(b) Mortar Bed Placement

The mortar bed, including reinforcement if shown, must be placed, consolidated, and finished to the required thickness.

The mortar bed surface must be true and pitched as shown, without high or low spots. The mortar bed surface must not vary more than 1/8 inch in 8 feet from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

In no case must the allowed tolerances result in offsets between adjoining tiles, low spots on finished tile surfaces than can pond water, or finished tile surfaces that are not plumb or not true.

Pea gravel mortar must be tightly compacted so as to fill all voids in the aggregate. Obtain compaction using a stand-up wooden tamper weighing not less than 35 pounds or using a motor driven tamper and leveler.

Pea gravel mortar beds must be damp cured under cover for not less than 72 hours at a temperature of at least 70 degrees F.

Cement mortar beds to receive a tile bond coat must be damp cured under cover for a minimum of 48 hours at a temperature of at least 70 degrees F.

Cement mortar beds to receive an epoxy bond coat must be damp cured under cover for a minimum of 96 hours at a temperature of at least 70 degrees F and allowed to dry thoroughly prior to setting tile.

99-09315C(5)(c) Shower Pan

Not Used

99-09315C(5)(d) Tile Bond Coat

The tile bond coat mortar must be mixed under the manufacturer's instructions. The consistency of the mixture must be such that ridges formed with the recommended notched trowel must not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces must be dampened before placing the bond coat as necessary for tile installation, but the setting bed must not be soaked. Setting bed surfaces for epoxy bond coat must be dry.

The bond coat must be floated onto the cured mortar bed surface with sufficient pressure to cover the surface evenly with no bare spots. The surface area to be covered with the bond coat must be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat must be combed with a notched trowel under the manufacturer's instructions no more than 10 minutes before installing tile. Tile must not be installed on a skinned-over bond coat.

99-09315C(5)(e) Installing Tile

Tile must be installed under the manufacturer's instructions and must be set solid and well bonded to the substrate.

Tile set on a tile bond coat must be installed under ANSI A108.5. Tile set on an epoxy mortar must be installed under ANSI A108.6.

Cut tiles must be made with saws. Cut edges must be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts must be accurately made to neatly fit the tile in place. Cut edges must not be butted against other tile. Cut tile must be at least half the size of a full size tile.

Tile must completely cover wall areas behind mirrors and fixtures.

Tile must be installed so that the finished tile surface does not vary more than 1/8 inch in 8 feet from the finished tile surface shown. In no case must there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

Tiles must be firmly pressed into the freshly notched bond coat. Tile on interior surfaces must be tapped and beat into a true surface and to obtain at least 80 percent coverage by the mortar on the back of each tile. Tile on exterior surfaces must have 100 percent coverage and must be back-buttered immediately before setting the tile.

If tile is face mounted, the paper and glue must be removed within one hour after tile is installed. All tiles that do not meet the requirements for joint and surface tolerances must be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles must be removed to the bottom of tile.

Marble Thresholds: Marble thresholds must be set in same type of setting bed as abutting tile unless otherwise shown.

Joints: Joints between tile must be continuous both vertically and horizontally. Joints must be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints must also align. Joint width must be per the tile manufacturer's instructions.

99-09315C(5)(f) Grouting Tile

Grout must be mixed, applied and cured under the manufacturer's instructions and under ANSI A108.10 for cement grout and ANSI A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material must be removed before grouting. Joints between glazed wall tile must be wetted if they have become dry. Joints for epoxy mortar must be dry.

Grouting must not begin until at least 48 hours after installing tile.

A maximum amount of grout must be forced into the joints between tiles under the manufacturer's instructions. The grout must be finished (1) to the depth of the cushion for cushion edge tile and (2) flush with the surface for square edge tile. All gaps and skips in the grout spaces must be filled.

Mortar or mounting mesh must not show through the grouted joints.

The finished grout must have a uniform color and must be smooth without voids, pinholes or low spots.

Expansion joints must be kept free of grout or mortar.

Grout must be protected from freezing or frost for a least 5 days after installation.

99-09315C(5)(g) Miscellaneous Materials

Expansion Joints:

> Expansion joints must be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing must not exceed 16 feet in any direction.
>
> All expansion joints must be made with sealant over backer rods. The thickness of sealant at the center of expansion joints must not exceed the width of the joint. Joint edges must be primed under the sealant manufacturer's instructions.

Edge Strips: Edge strips must be installed at openings where thresholds have not been shown and the tile floor abuts other flooring materials at the same level. Edge strips must be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding Tile: Tiled surfaces must be sounded with a metal bar or chain for improperly bonded tiles or setting beds. Tiles or setting beds that emit a hollow sound must be replaced.

Replacement: Cracked, chipped, broken, or otherwise defective tiles must be removed and replaced. All tiles that differ more than 1/16-inch in elevation from adjacent tile edges must be removed and replaced.

99-09315C(5)(h) Curing

After the installation of tile and the grouting of joints, the tile and grout must be cured by keeping the surface continuously damp for at least 72 hours. Curing materials must not stain the tile or grouted joints. Curing methods must not erode away the grout.

After grouting, horizontal tiled surfaces must be closed to traffic, and all tiled surfaces must be kept free from impact, vibration or shock for at least 72 hours.

Sealing Unglazed Quarry Tile: Sealer must be applied to unglazed quarry tile only. The sealer must be applied under the manufacturer's instructions.

99-09315C(6) Cleaning and Protection

Cleaning Tile Surfaces:

> All exposed tile surfaces must be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile must comply with the tile manufacturer's instructions. Cleaners must not be harmful to materials or surfaces of abutting floors, walls, and ceilings. Rinse tile work thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, polish tile surfaces using a soft cloth.
>
> Tile work must be cleaned and polished immediately before Contract acceptance. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials must be removed.

Protection: Tile surfaces damaged by construction operations must be retiled

99-09315D Payment

Not Used

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

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

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

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

99-09614C Construction

Install securely under the manufacturer's installation instructions.

99-09614D Payment

Not Used

99-09659 RESILIENT BASE

99-09659A General

99-09659A(1) Summary

Scope: This work consists of installing resilient base.

99-09659A(2) Definitions

Not Used

99-09659A(3) Submittals

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

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials—Flooring Systems: Submit the following:

1. Product data for wall base.
2. Certification of compliance with referenced standards:
3. Test results and certificate of compliance with testing and product requirements of the California Department of Health Services. Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

99-09659A(4) Quality Control and Assurance

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials—Flooring Systems: Furnish flooring materials which comply with the Resilient Floor Covering Institute's FloorScore. Comply with local requirements if more stringent.

Low-Emitting Materials—Flooring Systems: Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

99-09659B Materials

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

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

99-09659C Construction

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

99-09659D Payment

Not Used

99-09661 VINYL COMPOSITION TILE

99-09661A General

99-09661A(1) Summary

Scope: This work consists of installing vinyl composition tile.

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

99-09661A(2) Definitions

Not Used

99-09661A(3) Submittals

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

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

Low-Emitting Materials – Flooring Systems: Submit the following:

1. Product data for hard surface flooring (including vinyl).
2. Certification of compliance with referenced standards:
   Hard Surface Flooring: FloorScore.
3. Test results and certificate of compliance with testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

99-09661A(4) Quality Control and Assurance

Low-Emitting Material—Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials—Flooring Systems: Provide flooring materials which comply with the following standards. Comply with local requirements if more stringent.

1. Hard surface flooring (including vinyl): FloorScore.

IEQ Credit 4.3, Low-Emitting Materials—Flooring Systems: Provide flooring materials which comply with the California Department of Public Health Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

99-09661B Materials

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

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

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

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

99-09661C Construction

99-09661C(1) Preparation

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

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

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

99-09661C(2) Application

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

Edger strips must be installed at free edges.

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

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

Patching Existing Tiled Floors:

> Tile for patching existing floors must closely match the color and pattern of the existing adjacent floor tile, except tile of contrasting color and pattern may be used when authorized by the Engineer.
>
> If the size of existing tile on floors which are to be patched can not be matched, enough existing tile must be removed to permit the installation of full sized 12" x 12" tiles. The limits of existing tile removal and new tile installation must be authorized by the Engineer.

Replacement of Existing Tile: Replacement of existing tile flooring where ordered by the Engineer is change order work.

99-09661D Payment

Not Used

99-09680 CARPETING

99-09680A General

99-09680A(1) Summary

Scope: This work consists of installing carpeting.

99-09680A(2) Definitions

Not Used

99-09680A(3) Submittals

Product Data: Submit manufacturer's descriptive data for carpet, pattern line, carpet cushion and adhesives, and installation instructions. Submit the manufacturer's standard colors for color selection.

Samples: Samples must include individual samples of each carpet and carpet cushion to be installed. After the color and pattern have been authorized, submit one sample at least 24 by 24 inches of the (1) carpet and (2) carpet cushion.

Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

IEQ Credit 4.3, Low-Emitting Materials – Flooring Systems: Submit the following:

1. Product data for carpet, carpet cushion, and carpet adhesive.
2. Certification of compliance with referenced standards:
   - 2.1. Carpet and Rug Institute Green Label Plus for carpet.
   - 2.2. Carpet and Rug Institute Green Label for carpet cushions.
   - 2.3. Complying with VOC limits under IEQ for carpet adhesive.
3. Test results and certificate of compliance with testing and product requirements of the California Department of Health Services. Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

Maintenance Instructions: Submit the manufacturer's instructions for maintenance of the installed carpet. Include methods and frequency for maintaining optimum condition under anticipated traffic and use conditions.

99-09680A(4) Quality Control and Assurance

Single Source Responsibility: Materials must be produced by a single manufacturer for each type of carpet.

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

Low-Emitting Materials—Flooring Systems: Furnish flooring materials which comply with the following standards. Comply with local requirements if more stringent.

1. Carpet and Rug Institute Green Label Plus for carpet.
2. Carpet and Rug Institute Green Label for carpet cushions.
3. Complying with VOC limits under IEQ for carpet adhesive.

Low-Emitting Materials—Flooring Systems: Furnish flooring materials which comply with the California Department of Public Health *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers*.

99-09680B Materials

99-09680B(1) General

Carpeting and carpeting materials must be rated by the manufacturer as suitable for heavy pedestrian traffic and as suitable for use under chairs with casters.

99-09680B(2) Delivery, Storage, and Handling

Materials must be delivered to the job site in original factory wrappings and containers, clearly labeled with manufacturer, brand name, quality or grade, fire hazard classification, and lot number.

Materials must be stored in original undamaged packages and containers inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

99-09680B(3) Carpet

Carpet must be third generation nylon, continuous filament yarn with a woven polypropylene backing. Yarn must be solution dyed. Carpet construction must be textured loop, 1/8-inch gauge minimum, with pile height between 5/32 to 1/4 inch, and a yarn weight of at least 28 ounces per square yard. Carpet must be permanently anti-static.

99-09680B(4) Carpet Accessories

Carpet Cushion: Carpet cushion must be closed cell foamed rubber sheet, made from styrene-butadiene rubber, at least 5/32 inch thick, and weighing at least 62 ounces per square yard. Cushion must have a top and bottom facing that will prevent liquid from being absorbed into the cushion.

Adhesives:

Carpet cushion to floor adhesive must be pressure sensitive adhesive per the cushion manufacturer's instructions.

Carpet to carpet cushion adhesive must be a premium quality, multi-purpose carpet adhesive, compatible with the carpet backing and per the carpet cushion manufacturer's instructions.

Primer, Sealant, Leveling Compound and Crack Filler: Primer, sealant, leveling compound and crack filler must be per the carpet cushion manufacturer's instructions.

Seaming Adhesive: Hot-melt seaming adhesive or similar product per the carpet cushion manufacturer's instructions. Use for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

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

99-09680C Construction

99-09680C(1) General

Protect the carpet from heavy traffic or wear for 24 hours after installation.

Furnish protective methods and materials to ensure that carpeting will be without deterioration or damage until Contract acceptance.

99-09680C(2) Preparation

Surfaces to receive carpet must be free of cracks, localized depressions and bumps. Bumps must be ground flat and holes, depressions, and cracks must be filled with leveling compound or crack filler.

Before installing carpet and carpet cushion, the surface must be dry broomed clean and free from paint, oil grease, mortar, plaster droppings, wax, or other materials that will interfere with the adhesives.

New concrete must be cured for at least 30 days and be free from parting or curing compound that interfere with the adhesives. Concrete surfaces must be checked for dusting. Sealer must be applied to dusting concrete surfaces.

Carpet, carpet cushion and adhesives must be stored at a temperature of at least 65 degrees F and a humidity of not more than 65 percent for at least 24 hours before installation. Locations where carpet is to installed must be maintained between 65 to 90 degrees F for at least 72 hours before and for 5 days following installation.

99-09680C(3) Installation

Applying Primer or Sealer: Primer or sealer must be thoroughly brushed on the surface under the adhesive manufacturer's instructions and must be thoroughly dry before application of adhesives.

Installing Cushion:

Install carpet cushion onto a continuous film of adhesive. Apply adhesive under the manufacturer’s instructions. Cushion must be installed in the longest length possible with consideration for traffic patterns and seam placement.

When cushion adhesive is tacky, place cushion onto the adhesive and adjust as necessary to ensure there is no gap at seams and full contact is made with adhesive. Air bubbles must be smoothed out to provide a level surface.

Installing Carpet:

Install carpet, including seaming techniques and seaming cement, under the carpet manufacturer's instructions.

Spread the carpet full width on cushion for 24 hours before installation.

Trim seam edges using appropriate seam cutting tools before applying adhesives. Seams must not be cut where cutting tools will penetrate the carpet cushion. Carpet seams must be at right angles to the cushion seams and not directly over the cushion seams.

Spread carpet adhesive uniformly over the cushion under the manufacturer’s instructions. After sufficient time, carpet must be firmly pressed into the adhesive using a roller weighing approximately 50 pounds to ensure carpet has full contact with adhesive. Carpet must be rolled in both directions.

Install carpet in wall to wall continuous lengths with widths as wide as possible. True cut edges and treat edges to form non-raveling seams where exposed. Trim excess carpet to the wall using a wall trimmer adjusted to net trim.

Where carpet patterns or floor finish between rooms differ, pattern or material break must occur at the centerline of the common wall, except at door openings the break must occur at the centerline of the closed door.

Install edge strips at free edges.

99-09680C(4) Cleaning

Debris and unusable scraps must be removed. Carpet must be vacuumed using a commercial machine with face-beater element.

Soiled spots, excessive adhesive or other unsightly material on the carpet must be removed under the carpet manufacturer's instructions. Where spots cannot be removed, replace the carpet. Trim protruding face yarns using sharp scissors.

99-09680C(5) Extra Materials

After completion of the work, at least 2 percent of each type and color of carpet and cushion, as well as usable scraps, must be delivered to the Engineer at the job site.

99-09680D 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.

Low-Emitting Materials – Paints and Coatings: Submit product data for paints and coatings to be used on-site and inside the building weatherproofing system, indicating product name, manufacturer's generic description, chemical composition, and VOC content.

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

99-09900A(4) Quality Control and Assurance

Low-Emitting Materials—Paints and Coatings: For application inside the weatherproofing system and applied on-site furnish paints and coatings that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

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

Wood:

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

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

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

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

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

Galvanized Metal:

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

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

Steel and Other Ferrous Metals: Surface must be cleaned 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.

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

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

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

Previously Coated Surfaces:

Dirt, oil, grease, or other surface contaminants must be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections must be filled as specified for new work. Mildew must be removed by mildew wash. Chalking paint must be removed by hand cleaning. The surfaces of existing hard or glossy coatings must be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting must not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings must be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas must be pretreated and primed as specified for new work.

99-09900C(3) Application

Coatings must be applied under the manufacturer's instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

Mixing, thinning and tinting must comply with the manufacturer's instructions. After thinning, the coating must comply with the regulatory requirements.

Coatings must be applied only when surfaces are dry and properly prepared.

Cleaning and painting must be scheduled so that dust and other contaminants from the cleaning process do not fall on wet, newly coated surfaces.

Materials required to be coated must have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

Surface Finish Application:

Each coat must be applied to a uniform finish. Finished surfaces must be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system must closely resemble the final color coat, except each application must provide enough contrast in shade to distinguish the separate applications.

Work Required Between Applications:

Each application of material must be cured under the coating manufacturer's instructions before applying the next coating.

Enamels and clear finishes must be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer must be spot applied whenever bleeding substances are visible through the previous application of a coating.

Timing of Applications: The first application of the coating system must be during the same work shift that the final surface preparation was performed. Additional coats must be applied as soon as the required drying time of the preceding coat, specified in the coating manufacturer's instructions, has been met.

Application Methods:

Coatings must be applied by brush, roller or spray. Rollers must not leave a stippled texture in the paint film. Extension handles for rollers must not be greater than 6 feet in length.

If spray methods are used, surface deviations and imperfections such as overspray, thickness deviations, lap marks, and orange peel must be considered as evidence the work is unsatisfactory and 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 - CEMENT PLASTER AND CONCRETE

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 2 - 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 3 - GYPSUM BOARD

One Prime Coat:

Primer Sealer: Latex, Interior, MPI List Number 50

2 Finish Coats:

Flat: Latex, Interior, MPI Gloss Level 1, MPI List Number 53
Velvet-like: Latex, Interior, MPI Gloss Level 2, MPI List Number 44
Semi-Gloss: Latex, Interior, MPI Gloss Level 5, MPI List Number 54
Gloss: Latex, Interior, MPI Gloss Level 6, MPI List Number 114

SYSTEM 4 - STEEL AND OTHER FERROUS METALS, SEMI-CORROSIVE ENVIRONMENT

VISIBLE IN FINISHED WORK:

2 Prime Coats:
Primer: Rust Inhibitive, Water Based, MPI List Number 107
2 Finish Coats:
Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

NOT VISIBLE IN FINISHED WORK:

2 Prime Coats:
Primer: Rust Inhibitive, Water Based, MPI List Number 107

SYSTEM 5 - WOOD, PAINTED

1 Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Low Sheen: Latex, Exterior, MPI Gloss Level 3/4, MPI List Number 15
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11
Gloss: Latex, Exterior, MPI Gloss Level 6, MPI List Number 119

SYSTEM 6 - WOOD, STAINED

One Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Solid Hide: Stain, Exterior, Water based, MPI List Number 16

99-09900C(6) Color Schedule

Colors must be as shown.

99-09900D Payment

Not Used

99-09953 FIBERGLASS REINFORCED PLASTIC PANELS

99-09953A General

99-09953A(1) Summary

Scope: This work consists of installing FRP panels and trim molding.

99-09953A(2) Definitions

FRP: fiberglass reinforced plastic.

99-09953A(3) Submittals

Submit manufacturer's descriptive data, installation instructions, and finish options.

Installation instructions must show the FRP panel manufacturer's method of installation.

Submit the manufacturer's standard color palette for FRP panels and trim molding. Color will be selected from the manufacturer's standard color palette by the Engineer.

MR Credit 5, Regional Materials: For materials with regional content, submit product data indicating location and radius distance from job site of material manufacturer and point of extraction, harvest, or

IEQ Credit 4.1, Low-Emitting Materials – Adhesives and Sealants: Submit product data for adhesives and sealants to be used on-site and inside building weatherproofing system, indicating VOC content.

99-09953A(4) Quality Control and Assurance

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-09953B Materials

FRP Panels: FRP panels must have a Class A flame-spread rating and minimum nominal thickness of 0.090 inch. FRP panels must be Marlite, Class I/A FRP; Kemlite, Fire-X Glasbord; or equal.

Trim Molding: Trim molding must be the FRP manufacturer's standard vinyl molding with nailing flanges and a 3/8-inch deep channel of sufficient width to receive panels and sealant.

Adhesives and Sealants: Adhesives and sealants must be per the FRP panel manufacturer's instructions.

99-09953C Construction

99-09953C(1) General

Not Used

99-09953C(2) Installation

Install the FRP panels and trim molding under the manufacturer's installation instructions.

Nail the trim molding through the flange into solid wood backing. All nails must be concealed by the FRP panels in the completed installation. Trim must be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard trim length. If more than one trim piece is used on one wall, the pieces must be approximately equal length and at least 4 feet in length. All FRP panel edges must be covered by a trim molding.

FRP panels must be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard panel length. If more than one panel piece is used on one wall, the panels must be approximately equal length and at least 4 feet in length.

99-09953C(3) Clean-up

Protect adjacent surfaces from adhesive and sealant. Remove excess adhesive and sealant as the installation progresses using a solvent or cleaning agent under the FRP panel manufacturer's instructions.

99-09953D Payment

Not Used

99-09957 ACOUSTIC CEILING TILE

99-09957A General

99-09957A(1) Summary

Scope: This work consists of installing acoustic ceiling tile.

99-09957A(2) Definitions

Not Used

99-09957A(3) Submittals

Submit manufacturer's descriptive data and installation instructions. Submit the manufacturer's standard color palette for acoustic tiles. After the texture and color have been authorized, submit 2 samples.

Low-Emitting Materials—Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-09957A(4) Quality Control and Assurance

Single Source Responsibility: Obtain acoustic ceiling tile from a single manufacturer.

Low-Emitting Material—Adhesives and Sealants: For application inside the weatherproofing system and applied on-site furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-09957B Materials

Acoustic Ceiling Tile: Acoustic ceiling tile must be 12 by 12 inches, at least 5/8-inch thick, with square edges, nondirectional natural fissured texture, and a factory-applied, washable, off-white vinyl latex finish. Tile must comply with ASTM E 1264, Type III, Form 2. Tile must have a Noise Reduction Coefficient of at least 0.65. Tile must have a Class A flame spread rating.

Adhesives: Adhesives must be per the acoustic ceiling tile manufacturer's instructions.

Acoustical Sealant: Acoustical sealant must comply section 99-07920.

99-09957C Construction

Surfaces to receive acoustic ceiling tile must be clean, dry, and level and must be prepared under the adhesive manufacturer's instructions.

Install acoustic ceiling tile under the manufacturer's instructions. Install tile only when the ambient room temperature is between 55 and 95 degrees F.

Upon completion of the suspended ceiling work, one unopened carton of acoustical ceiling tile must be delivered to the Engineer at the job site.

99-09957D Payment

Not Used

99-10162 METAL TOILET PARTITIONS

99-10162A General

99-10.04A(1) Summary

Scope: This work consists of installing metal toilet partitions.

99-10162A(2) System Description

Metal toilet partitions consists of panels, doors, floor anchored pilasters and shoes, urinal screens, fasteners, anchorages, and hardware. Internal reinforcement must be provided at all fasteners, anchorages, hardware, and accessories.

Doors, panels, pilasters, and urinal screens must have a factory applied, baked on enamel finish consisting of not less than one prime coat over a chemically pretreated base followed by at least one baked on enamel finish coat.

99-10162A(3) Definitions

Not Used

99-10162A(4) Submittals

Manufacturer's descriptive data, catalog cuts, and installation instructions must be submitted.

Manufacturer's standard color palette must be submitted. The Engineer will select colors from the standard color palette.

Submit shop drawings that show the plan layout, door and panel elevations, and all details required for the complete installation and anchorage of the partition system.

Manufacturer's descriptive data, catalog cuts, and installation instructions must be submitted.

99-10162A(5) Quality Control and Assurance

Not Used

99-10162B Materials

Doors and Panels:

Doors and panels must be flush, one-inch minimum thickness, formed of two 0.034-inch (22-gage) minimum thickness, galvanized steel sheets over a honeycomb core. Doors and panels must have formed edges sealed with a continuous oval crown locking strip, and must be mitered, welded and finished at the corners.

Doors must have controlled action hinges, with vertical pintle and ball bearing roller operating on adjustable cams, or moving parts of nylon and stainless steel. Top pivots must be recessed into edges of doors.

Doors must be provided with slide bar latch and a combination coat/hat hook and door stop, except as otherwise specified.

Doors on stalls designated as accessible must be furnished with an automatic door closing device and U-shaped door pulls, located immediately below the latch on the inside and outside of the door.

Pilasters: Pilasters must be 1-1/4 inches thick, of the same construction as the doors and panels, except face sheets must be 0.052 inch galvanized steel, with adjustable, leveling base incorporating two 3/8-inch diameter stud expansion anchors with leveling nuts.

Urinal Screens: Urinal screens must be wedge type, wall-mounted, and of the same construction as the doors and panels, except face sheets must be 0.040-inch (20-gage) minimum thickness. All fasteners must be concealed.

Fasteners and Anchorages: Fasteners and anchorages must be stainless steel with vandal resistant heads.

Hardware: Hardware must be highly polished chromium plated, cast alloy, or heavy duty anodized aluminum.

Pilasters Anchors: Pilasters anchors must be integral stud anchor type or internally threaded expansion sleeve type with single cone expander. Self-drilling type anchorage must not be used.

Pilaster Shoes: Pilaster shoes must be one-piece, stainless steel, with concealed hold down clips, and of sufficient height to completely cover the base and anchors.

99-10162C Construction

99-10162C(1) Installation

Metal toilet partitions must be installed rigidly, securely, plumb, true, and under the manufacturer's instructions. Tops and bottoms of doors must align with tops and bottoms of panels, and all horizontal lines must be level.

Blocking must be provided in walls to receive anchorages.

Panels must be anchored with at least 3 brackets at each wall and pilaster. Two anchors must be used to fasten each pilaster base to the floor.

Doors must not bind during opening and closing. The clearance between the door edges and pilasters must be uniform, equidistant, and must not exceed 3/16 inch. Hinges must be adjusted to hold doors ajar when unlatched. Doors on stalls designated as accessible must return to the closed position.

Drilling, cutting, and fitting of wall and floor finishes must be concealed by the completed installation.

99-10162C(2) Clean-up

Toilet partitions must be cleaned, polished, and free of all defects. Chipped, dented, scratched, or otherwise damaged work must be replaced at the Contractor's expense.

99-10162D Payment

Not Used

99-10445 SIGNS

99-10445A General

99-10445A(1) Summary

Scope: This work consists of installing signs.

99-10445A(2) Definitions

Not Used

99-10445A(3) Submittals

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

Manufacturer's standard color palette for acrylic signs must be submitted. The Engineer will select background and character colors from the standard color palette.

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

99-10445A(4) Quality Control and Assurance

Regulatory Requirements: Identification, directional, informational, exit, and accessibility signs and symbols must comply with the Identification symbols, 24 CA Code of Regs Pt 2 § 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.

Self-Luminous Sign (Exit):

Self-luminous sign must be internally illuminated, self-luminous exit sign powered by permanent integral tritium gas source. Sign must be listed by the California State Fire Marshal.

Sign housing must be ABS molding. Faceplate must be acrylic.

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 or mounting brackets.

99-10522A(2) References

Fire Extinguishers must comply with the requirements in California Code of Regulations, Title 19 Division 1, Chapter 3, “Portable Fire Extinguishers.”

99-10522A(3) Definitions

Not Used

99-10522A(4) Submittals

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

99-10522A(5) Quality Control and Assurance

Codes and Standards: Fire extinguishers must be Underwriters Laboratories or Factory Mutual Laboratories approved for the type, rating, and classification of extinguisher specified.

99-10522B Materials

99-10522B(1) Manufacturers

Acceptable Manufacturers: Manufacturers must be J. L. Industries; Larsen’s Manufacturing; Potter-Roemer; or equal.

99-10522B(2) Components

Fire Extinguisher: Fire extinguisher must be fully charged, multi-purpose dry chemical type, with charge indicator, hose and nozzle, and attached service record tag. Fire extinguisher must be of the capacity and type rating shown. Type 3A-40BC

Mounting Bracket: Mounting bracket must be the manufacturer's standard painted, surface mounted type.

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 semi-recessed 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

99-10801 TOILET AND SHOWER ACCESSORIES

99-10801A General

99-10801A(1) Summary

Scope: This work consists of installing toilet and shower accessories.

99-10801A(2) Definitions

Not Used

99-10801A(3) Submittals

Product Data: Manufacturer's descriptive data, installation instructions, and details must be submitted.

Certificates of Compliance: Submit a certificate of compliance for grab bars and folding shower seats. Certificates of compliance must include written confirmation that the grab bars and folding shower seats, backing, mounting devices, fasteners and their installation comply with the requirements in Structural strength, 24 CA Code of Regs Pt 2 § 1115B.7.2.

99-10801A(4) Quality Control and Assurance

Regulatory Requirements: Accessibility products must conform to CA Bldg Code chapter 11B division 6 plumbing elements and facilities. Grab bars and folding shower seats must comply with Grab bars, tub and shower seats, 24 CA Code of Regs Pt 2 CA Bldg Code section 11B-609 and 11B-610.

99-10801B Materials

Toilet Tissue Dispenser: Toilet tissue dispenser must be dual roll, surface mounted, stainless steel with satin finish, and approximately 6" x 11-1/2" x 6" in size. Dispenser must utilize standard toilet tissue rolls. The top roll must automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

Combination Paper Towel Dispenser and Waste Receptacle: Combination paper towel dispenser and waste receptacle must be semi-recessed, stainless steel with satin finish, and approximately 17" x 56" x 7-1/2" in size with 4-inch skirt. The paper towel dispenser must have a capacity of 1,000 single fold paper towels. The waste receptacle must have a capacity of at least 8 gallons. Quantity must be as shown.

Toilet Seat Cover Dispenser: Toilet seat cover dispenser must be surface mounted, stainless steel with satin finish, approximately 15" x 11-1/2" x 2" in size. One dispenser per toilet stall and wheelchair accessible compartment.

Napkin Receptacle: Napkin receptacle must be surface mounted, stainless steel with satin finish, hinged top and bottom, approximately one-gallon capacity container with disposable liner. One receptacle per women's toilet stall.

Waste Receptacle: Waste receptacle must be surface mounted, stainless steel with satin finish, and a capacity of at least 12 gallons. One receptacle per toilet room.

Clothes Hook: Clothes hook must be stainless steel with two prongs. Quantity must be as shown.

Paper Towel Dispenser: Paper towel dispenser must be surface mounted, stainless steel with satin finish, with a capacity of 1,000 single fold paper towels. One dispenser per lavatory.

Liquid Soap Dispenser: Liquid soap dispenser must be surface mounted, heavy-duty plastic dispenser for industrial use with a capacity of at least 24 ounces. Maximum operating force must be 5 pounds. One dispenser per lavatory.

Mirror, Wall Hung: Mirror, wall hung must be Number 1 quality, 1/4-inch thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror must have a heavy gage galvanized steel back and stainless steel frame. The frame must have a satin finish and must be mitered and welded and the corners must be ground smooth. Fasteners must not penetrate surfaces of the frame exposed to view. Mirror must be guaranteed against silver spoilage for not less than 10 years. Quantity must be as shown.

Grab Bar: Grab bar must be stainless steel with satin finish, and concealed, integral mounting flanges.

99-10801C Construction

Toilet and shower accessories must be installed under the manufacturer's instructions. Fasteners for mounting accessories must be concealed and vandal resistant.

Expansion anchors must be used for mounting accessories on masonry or concrete walls.

Toilet accessories must be mounted after painting work is complete.

All toilet room accessories must be mounted plumb, secure, and rigid.

Grab bars, and folding shower seats and their fasteners must be installed to comply with the requirements in Grab bars, 24 CA Code of Regs Pt 2 CA Bldg Code section 11B-609.8 and 11B-610.4.

99-10801D Payment

Not Used

99-12510 HORIZONTAL BLINDS

99-12510A General

99-12510A(1) Summary

Scope: This work consists of installing horizontal blinds.

Horizontal blinds must be standard, factory manufactured assemblies suitable for use on exterior wall windows.

99-12510A(2) Definitions

Not Used

99-12510A(3) Submittals

Product Data: Manufacturer's descriptive data, color chips, and installation instructions must be submitted.

99-12510A(4) Quality Control and Assurance

Not Used

99-12510B Materials

Horizontal Blinds:

Horizontal blinds must be nominal one inch wide, spring tempered virgin aluminum alloy horizontal slats supported by braided polyester ladders. Braided ladders must hold slats at equal spaces, parallel, straight, and must provide tilt control and adequate overlap of slats. The distance between ladders must not exceed 23 inches. Slat tilt must be adjustable by a transparent wand. Blinds must be adjustable to any height using lift cords.

Hardware must be enclosed in a metal head and the opening hardware must be clinched to the head. All metal parts must have a corrosion resistant coating.

99-12510C Construction

99-12510C(1) Installation

Horizontal blinds must be installed under the manufacturer's instructions.

99-12510D Payment

Not Used

99-11 EQUIPMENT

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, air conditioning, plumbing and natural gas 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.

Roof penetrations must be flashed and sealed watertight under section 99-07620.

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:

Pipes, Valves, and Fittings
Plumbing Fixtures
Heating and Air Conditioning System
Ventilation Fans and Ductwork
HVAC Controls and appurtenances
Water Heater

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:

Heating and Air Conditioning System
HVAC Controls and Appurtenances
Plumbing Fixtures
Ventilation Fans
Water Heater

99-15050A(5) Quality Control and Assurance

Codes and Standards: Mechanical work, including equipment, materials and installation, must comply with the CBC: CMC; CPC; CEC; 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

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)

A1: Schedule 40 galvanized steel pipe complying with ASTM A 53, with 150 psi galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A 53.

A2: Schedule 40 galvanized steel pipe complying with ASTM A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, must be used. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A 53.

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.

C1: Hub and plain end cast iron soil pipe with neoprene gaskets complying with Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings, and gaskets must be of one manufacturer.

C2: Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps complying with Cast Iron Soil Pipe Institute's Standard 301. Joint materials must be furnished by pipe manufacturer.

H1: Type DWV hard copper tubing complying with ASTM B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

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.

P1: Polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings complying with ASTM D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or complying with ASTM D2665 with solvent welded fittings. Rubber gaskets must comply with ASTM F 477. Stainless steel clamps with rubber boots must not be used.

P5: Polyethylene plastic gas pipe and fittings complying with ASTM D 1248 and D 2513 with Standard Dimension Ratio (SDR) 11, rated for 60 psi working pressure at 73°F, socket type fittings, joined by heat fusion.

P6: Polyvinyl chloride (PVC) natural gas pipe, Class 315, complying with ASTM D 2513. Fittings must be Schedule 40 complying with ASTM D 2513, and must be primed and glued. Primer must comply with ASTM F656. Solvent cement must comply with ASTM D2564. Approved adapters must be used for transition to other pipe materials.

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 Hot Water Tanks): Insulating connection (to hot water tanks) 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.

Gas Valve: Gas valve must be natural gas service type, bronze body, quarter turn, flathead and rated for 125 psi. Gas valve must be Crane, American or equal.

99-15060B(3) Hydrants

Wall Hydrant:

> Wall hydrant must be ¾-inch, non-freeze type, exposed, nickel bronze head with bronze casing, integral antisiphon vacuum breaker, hinged cover, and stainless steel recessed box. Wall hydrant must comply with ANSI/ASME A112.21.3M. Operating key for control valve must be provided. Wall hydrant must be Jay R. Smith Model 5509 QT, Josam Model 71050, Zurn, Model 1310; or equal.

99-15060B(4) Cleanouts

Cleanout Through Wall: Cleanout through wall must be cast iron cleanout tee type with polished stainless access plates. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout 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 membrane, access frame must be provided with membrane clamping flange. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, 6000 Series; Smith, 4021 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations must be heavy duty, floating pipe type with cast iron cover. Cleanouts must be Wade, No. 6000 TY; Smith, No. 4231; Zurn, No. 1474; or equal.

Cleanout to Grade: Cleanout to grade must be cast iron ferrule type. Plug must be countersunk brass or bronze with tapered threads. Cleanout to grade must be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

99-15060B(5) Miscellaneous Items

Water Hammer Arrestor: Water hammer arrestor must be Type "K" hard-drawn copper body with piston. Arrestor compression chambers must be pneumatically charged. Water hammer arrestors must be tested and certified under the Plumbing and Drainage Institute Standard: PDI-WH201 or ASSE 1010 and sized as shown.

Automatic Trap Primer Valve: Valve must:

1. Be made of cast bronze
2. Include an integral vacuum breaker
3. Have a non-liming internal operating assembly with gasketed bronze cover
4. Have an access panel installed in an accessible location

Provide Zurn Z1022; Precision Plumbing Products Inc. P2-500 for 2 drains or P1-500 for 4 drains; Wade W2400; or equal.

Access Door: Access door must be 16-gage prime coated steel, face mounting square frame, minimum 12” x 12” door with concealed hinge and screwdriver latch.

Compression Stop (Exposed): Compression stop (exposed) must be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Compression Stop (Concealed): Compression stop (concealed) must be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies must be Chicago, 1771; Zurn, BC40; Precision Plumbing Products, 500; or equal.

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.

Pipe Hanger (for piping supported from overhead): Pipe hanger (for piping supported from overhead) must be Anvil International, Model RH260; Super Struct, C711; or equal.

Pipe Wrapping Tape and Primer:

Pipe wrapping tape must be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 20 mils. Wrapping tape must be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer must be compatible with the pipe wrapping tape used.

Floor, Wall, and Ceiling Plates: Floor, wall, and ceiling plates must be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates must be sized to completely cover the hole.

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
8. Compliant with VOC requirements of LEED and the local air district

If other types of sealants are used for other applications, comply with requirements under section 99-07920.

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 or A1
Domestic water underground within 5 feet of the building	A1 or H2
Sanitary drain piping above ground in building	H1, C1, or C2
Sanitary drain and vent piping underground within 5 feet of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Sanitary drain pipe, 5 feet beyond the building	P1
Natural gas, above ground	A1 or B2
Natural gas, underground	B2 (plastic coated), P5 or P6
Equipment drains and relief valve discharge	H3 or A1

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.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas must have concealed piping.

Piping must not be run in floor fill, except as shown.

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.

Exposed supply and drain piping in rest rooms must be chrome finished.

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.

Plastic pipe used for natural gas must be below grade outside of building only. Transition to Class B2 plastic coated must be before meter, regulator, or building wall with approved metal to plastic transition fitting. PVC natural gas pipe must be installed under the International Association of Plumbing and Mechanical Officials (IAPMO) Standard: IS10.

Forty-five degree bends must be used where offsets are required in venting. Vent pipe headers must be sloped to eliminate any water or condensation.

Vent piping must extend a minimum of 8 inches above the roof.

Horizontal sanitary sewer pipe inside buildings must be installed on a uniform grade of not less than ¼ inch per foot unless otherwise shown.

Drainage pipe must be run as straight as possible and must have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends must be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Water pipe near sewers:

Water pipe must not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 10 feet apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 12 inches between the top of the sewer and the bottom of the water pipe must be maintained.

When water and sewer pipe is installed in the same trench, the water pipe must be on a solid shelf at least 12 inches above the top of the sewer pipe and 12 inches to one side.

Pipe Sleeves:

The Contractor 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 or ceilings. 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.

Pipe Penetrations in Fire Rated Assemblies: Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration must be protected under section 99-07270.

Cutting Pipe: Pipe must be cut straight and true and the ends must be reamed to the full inside diameter of the pipe after cutting.

Damaged Pipe: Pipe that is cracked, bent or otherwise damaged must be removed from the work.

Pipe Joints and Connections:

Joints in threaded steel pipe must be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints must be made tight. Long screw or other packed joints will not be permitted. Any leaky joints must be remade with new material.

Exposed polished or enameled connections to fixtures or equipment must be made with special care, showing no tool marks or threads.

Cleaning and Closing Pipe: The interior of all pipe must be cleaned before installation. All openings must be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs must remain in place until their removal is necessary for completion of the installation.

Securing Pipe: Pipe in the buildings must be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports must be compatible with the piping or neoprene isolators must be used. Allowances must be made for expansion and contraction. Steel pipe must have hangers or supports every 10 feet. Copper pipe one inch or less in diameter smaller must have hangers or supports every 6 feet and sizes larger than one inch must have hangers or supports every 10 feet. Plastic pipe must have hangers or supports every 3 feet. Cast iron soil pipe with neoprene gaskets must be supported at each joint. Vertical pipes must be supported with clamps or straps. Horizontal and vertical piping must be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and Supports:

Hangers and supports must be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports must be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports must be sized to fit the outside diameter of pipe or pipe insulation. Hangers must be removable from around pipe and must have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place must be compatible with piping material.

Hanger rods must be provided with locknuts at all threaded connections. Hanger rods must be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
½” to 2”	3/8”
2½” to 3½”	1/2"

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.

Thrust Blocks:

Thrust blocks must be formed by pouring concrete between pipe and trench wall. Thrust blocks must be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground must be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 2 inches and larger, and all capped connections.

Union: Unions must be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions must be located so piping can be easily disconnected for removal of equipment or tanks. Unions must be omitted at compression stops.

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

Insulating Union and Insulating Connection:

Insulating union and insulating connection must be provided where shown and at the following locations:

1. In metallic water and gas connections into each. Insulating connections must be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.

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

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 AND HYDRANTS

Hose Faucet and Hydrants: Faucets and hydrants must be installed with outlets 18 inches above finished grade.

99-15060C(4) INSTALLATION OF CLEANOUTS

Cleanouts:

A concrete pad 18 inches long and 4 inches thick must be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings must be used from Wye to surface. Required clearance around cleanouts must be maintained.

Cleanout risers outside of a building installed in a surface other than concrete must terminate in a cleanout to grade. Cleanout to grade must terminate in a valve box with cover marked "CO-SS". Top of box must be set flush with finished grade. Cleanout plug must be 4 inches below grade and must be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, must terminate in a cleanout through floor.

99-15060C(5) INSTALLATION OF MISCELLANEOUS ITEMS

Water Hammer Arrestor: Water hammer arrestor must be installed so that they are vertical and accessible for replacement. Water hammer arrestor must be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location must be where shown or as authorized by the Engineer.

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.

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
Sanitary sewer and vent	10-foot head	Water
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.

Sanitary sewers must be cleared of obstructions before testing for leakage. The pipe must be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug must be moved slowly through the pipe with a tag line. The Contractor must remove or repair any obstructions or irregularities.

Sanitary sewer pipes beyond 5 feet perpendicular to the building must be tested for leakage for a period of not less than 4 hours by filling with water to an elevation of 4 feet above average invert of sewer or to top of manholes where less than 4 feet deep. The system must show no visible leaks The sewer may be tested in sections with testing water progressively passed down the sewer as feasible. Water must be released at a rate that will not create water hammer or surge in plugged sections of sewer.

Test Procedures:

Rough Plumbing (Soil, Waste, and Vent): Verify piping materials and test upon completion of rough piping installation to ensure watertight system.

Water Test: Apply water test to drainage system in its entirety or in sections after rough piping is installed. If applied to the complete system, tightly close each opening in piping, except highest opening, and fill with water to the point of overflow. If the system is tested in sections, tightly plug each opening except the highest opening of the section under test, and fill with water.

1. Do not test a section with less than 10 feet head of water.
2. In testing successive sections, test at least the upper 10 feet of the following section so that each joint or pipe in the building, except the uppermost 10 feet of the system, is subjected to a test with more than a 10 foot head of water.
3. Keep water in system or in the portion under test for at least 15 minutes prior to inspection; the system must be tight at each point.

Sanitary Systems: After plumbing fixtures and floor drains are set and traps filled with water, verify drainage system materials and test. Ensure that system is gas tight by a smoke test or peppermint test.

Water Systems: When roughing in is completed and before fixtures are set, test hot water return and cold water piping systems at hydrostatic pressure of 150 psi for at least 4 hours to permit inspection of each joint. Where a portion of water piping system is concealed before completion, test portion separately the same as specified for system.

Exceptions: Exclude equipment and accessories such as plumbing fixtures or water heaters which may be damaged if subjected to full test pressure.

99-15060D Payment

Not Used

99-15140 GENERAL

Summary

This section includes specifications for pipes, fittings, valves, and appurtenances.

Definitions

ROWD: Report of Waste Discharge for the Regional Water Quality Control Board, as defined in the Water Code § 13260

Submittals

General

You must submit the following as informational submittals:

1. ROWD filed with the Santa Ana RWQCB if onsite discharge of water. The payment for the ROWD filing is change order work.
2. Bacteriological test results
3. Working drawing showing complete layout and installation details
4. Chlorinated water disposal plan incorporating AWWA C655-09 Standards

Product Data

You must submit product data for:

1. Pipes and fittings
2. Unions
3. Flexible couplings
4. Valves
5. Valve box
6. Backflow preventer
7. Underground tracer tape

Quality Control and Assurance

General

You must notify the Engineer 10 days before starting construction. Provide a schedule for all construction activities.

Regulatory Requirements

You must comply with:

1. Water Code, §§ 13750.5–13753
2. Santa Ana RWQCB, waste discharge requirements
3. California Waterworks Standards, 22 CA Code of Regs§§ 64551-64604, and the California Plumbing Code, 24 CA Code of Regs Pt 5.
4. ANSI/AWWA C 511, "AWWA Standard for Reduced-Pressure-Principle Backflow-Prevention Assembly," and Drinking Water Supplies, 17 CA Code of Regs §§ 7583-7630

MATERIALS

General

Pipes, fittings, valves, and appurtenances in contact with water must be NSF certified.

Pipes and Fittings

Galvanized steel pipe (GPS) must be Schedule 40 conforming with the requirements in ASTM A 53/A 53M, with Class 150 galvanized malleable iron screwed fittings and galvanized steel couplings. The weight of the zinc coating must be not less than 90 percent of the specified in ASTM A 53/A 53M..

PVC (less than 4-inch Diameter) pipes and fittings must be Schedule 80 conforming to the requirements in ASTM D 1785. Pipe must have bell ends conforming to the requirements in ASTM D 3139, or may be

plain end with solvent welded couplings and fittings conforming with the requirements in ASTM D 2466 or D 2467.

PVC (4-inch or greater Diameter) pipe and fittings must have bell ends conforming with the requirements in ANSI/AWWA C 900, Class 200, DR 14, and NSF 61 for potable water applications. Pipe bell end must have a solid cross section elastomeric ring conforming to the requirements in ASTM D 3139 and F 477. Fittings must be rubber-gasket, push-on joint conforming to the requirements of ASTM D 1784.

Unions (for GSP) must be Class 250, conforming with the requirements in ASTM B 16.39, galvanized threaded malleable iron, ground joint, and brass to iron seat.

Flexible coupling must be gasketed short sleeve type consisting of a mild steel middle ring with pipe stop, two rubber compound wedge-section ring gaskets, two mild steel follower rings and a sufficient number of galvanized steel bolts to compress the gaskets. All ferrous metal parts of the coupling must be hot-dip galvanized after fabrication.

Appurtenances

Valve box must be H-20 traffic rated, precast concrete box with a cast iron cover with no holes. Cover must be factory marked "WATER." Provide manufacturer's extensions as required.

Backflow preventer must be a reduced pressure principle assembly (RP). The RP must have two independently-acting, internally-loaded check valves with an automatic differential-pressure relief valve located between, shut-off valves located upstream and downstream of the two check-valves, wye pattern strainer, and test cocks to enable field testing. Only CDPH approved RP may be used.

Underground tracer tape must be permanent, detectable, bright colored in conformance with APWA Standards, continuous printed plastic tape with integral metallic strip or wire, intended for direct burial service, having a minimum width of 2inches. Printed lettering must read "CAUTION BURIED WATER LINE BELOW."

CONSTRUCTION

General

You must install pipes level and free of traps.

Pipe Joints and Connections

You must join threaded pipe with a PTFE tape or a pipe joint compound that is non-hardening and non-corrosive, placed on the pipe threads and not in the fittings. You must make joints watertight. Leaky joints must be remade with new material.

You must not use thread cement or caulking on threaded joints will. Threaded joints shall be made watertight. Leaky joints shall be remade with new material.

Cleaning and Closing Pipes

The interior of all pipes must be clean before installation. You must cap or plug all pipe as soon as it 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

You must place thrust blocks at changes in pipe direction. They must be sized to conform to the requirements in the CPC. Thrust blocks must be formed by pouring concrete between the pipe and trench wall. You must use thrust block and clamp with PVC pipe.

Water Pipes Near Sewers

You must not install pipes closer than 10 feet to any parallel sewers.

You must cross pipe above a sewer line, with a vertical separation of not less than 12inches. The measurement shall be maintained taken between the top of the sewer and the bottom of the water pipe.

Valves, Water Meters, and Flow Meters

You must install valves, water meters, and flow meters below ground in a valve or meter box. They must be installed with a minimum of 6 inches of crushed rock material in valve or meter box.

You must install supports for valves, water meters, and flow meters above ground adjacent to the them.

Backflow Preventer

You must install backflow preventer with a minimum of 12 inches clearance between the lowest portion of AM the assembly and finished grade or slab, or with the clearance as shown.

Meter and Valve Boxes

You must install meter and valve box to finish grade. You must install extensions as required

You must construct a reinforced concrete collar formed and cast-in-place around each meter and valve box. Collar must be broom surface finish or match the surrounding surface texture.

Meter and valve boxes to be installed in area to be paved or surfaced must be set to final grade after paving or surfacing has been completed.

Testing

Pipe, Valves, and Fittings

You must test all pipe assembly and prior to backfill in compliance with CPC. In addition, you must test the water piping for a period of not less than 4hours, at a pressure of 125psi. Pipe assembly must remain watertight.

You must repair all leaks and retest to determine that leaks have been stopped. You must dispose of excess potable water as directed by the Engineer in such a manner as to cause minimal erosion.

You must take precautions to prevent damage to tanks, gauges, and appurtenances. You must repair damage resulting from or caused by testing.

Backflow Preventer

You must test the backflow preventer for proper operation. Testing must be performed by certified Backflow Preventer Tester at the completion of the pipe installation and before water system being placed in operation.

The tester must hold a valid certificate as a Backflow Preventer Tester from the county in which the device is to be tested.

Testing for proper operation must conform to the procedures of the county in which the testing is being performed.

You must notify the Engineer at least 5 business days prior to testing backflow preventers.

Disinfection

You must flush and disinfect all piping and equipment from connection to existing pipe to all fixtures in buildings.

You must prepare and obtain the Engineers approval of a plan for the disposal of chlorinated water.

You must dispose of the chlorinated water in compliance with your plan for disposal of chlorinated water.

Sampling and Testing:

After the disinfection procedure is completed and before the facility is placed into service, you must sample the water for bacteriological quality. You must have water samples test and analyzed by a State certified laboratory for coliform organisms. A copy of the results shall be sent directly to the Engineer by the testing laboratory.

If the laboratory results fail to produce satisfactory bacteriological results, you must repeat the disinfection procedure and testing until a satisfactory bacteriological quality result is obtained.

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 domestic hot and cold water piping, above grade.

P-trap, hot water supply pipes and angle valves for lavatories and sinks, except in janitor closets or similar enclosed spaces, must be insulated. There must be no sharp or abrasive surfaces under lavatories or sinks.

Duct insulation must be installed on all rigid ductwork installed in concealed non-conditioned spaces.

Duct liner must be installed in all rectangular ductwork installed in exposed non-conditioned spaces and in exterior locations. Plenum liner must be installed in all plenums in non-conditioned spaces or in walls facing a non-conditioned space.

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, including adhesives and jackets, 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.

Duct insulation and wrapping material, including adhesives and jackets, located within buildings must be certified to have a composite flame spread of not more than 25 and smoke development rating of not more than 50 when tested under ASTM E 84.

Domestic Water 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.

PVC Jacket: PVC jacket must be rated for a service temperature of 175°F. PVC jacket must include covers specifically designed to cover pipe fittings.

Pipe Safety Insulation: Pipe safety insulation for P-traps, hot water supply pipes and angle valves must be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation must be configured to protect against contact. Pipe safety insulation must be Truebro Inc., HandiLav-guard; Plumberex Specialty Products, Handy Shield; or equal.

External Duct Insulation: External duct insulation must be 1½ inch thick, one-pound density glass-fiber blanket type. Material and coatings must be fire resistive and must be approved by the State Fire Marshal. External duct insulation must be Fiberglas, Type PF-336; Ultralite, No. 100; Pittsburgh Plate Glass, Superfine; Johns-Manville, Microlite; Silvercote, Silvercel; or equal.

Plenum and Duct Liner: Plenum and duct liner must be one-inch minimum thickness. Material and coatings must be fire resistive and must be approved by the State Fire Marshal. Liner must be Gustin-Bacon, Ultra-Liner duct insulation; Owens-Corning Fiberglas, Type CE; Gustin-Bacon, coated insulation Board No. 90-A; Owens-Corning Fiberglas 1½-pound density coated flexible duct liner; Johns-Manville, MicroBar, or 1½-pound density coated Microlite; Pittsburgh Plate Glass, Superfine 1½-pound density coated interior duct insulation; or equal.

Adhesive: Adhesive 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.

Studs: Studs must be cement-in-place type, pneumatic driven type or percussive welding type, and must have one-inch minimum diameter washers.

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. Jacket flap must be sealed down with factory applied self-sealing lap. Seams must be lapped not less than 1½ inches. Jacket must be secured with aluminum bands installed at 12-inch centers.

3. Exposed outdoor insulation must have an additional 0.016-inch minimum thickness aluminum jacket applied over the completed insulation. The jacket must have a factory applied moisture barrier and must be Childers; Smith; or equal.
   End joints must be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps must be placed at 8-inch centers. Jacket at ells and tees must be mitered, or premanufactured fitting jackets must be provided, with additional aluminum holding bands, as required. All joints must be sealed watertight using silicon type, heat resistant sealant.
4. 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.

Pipe Safety Insulation: Pipe safety insulation must be installed under the manufacturer's instructions.

Duct Insulation:

Ragged edges must be repaired or taped. Coverings must be neatly finished at joints and edges. Each joint must have a 2-inch minimum lap.

Where transitions are made between externally covered ducts and lined ducts, the lined duct must be overlapped 8 inches with external covering.

Insulation must be flush with but not cover control devices, damper controls or access doors.

Before insulation is wrapped around concealed ducts, an adhesive must be spot applied at a maximum of 4-inch centers on each side of the ducts to prevent sagging of the insulation. Insulation must be wrapped entirely around the ducts and must be wired securely in place with No. 16 copper clad wire, metal bands at least ½ inch wide or plastic ties. Supports must be spaced a maximum of 12 inches on center. Metal bands must be installed with the use of a banding machine. Seams in the insulation must be taped.

The finished insulation covering must be even and level and must not contain humps.

Plenum and Duct Liner:

Plenums and exposed ducts must be lined with plenum and duct liner. Plenums and ducts must be sized to provide the clear inside dimensions shown after the liner is installed.

The insulation must be applied with coated side exposed to air stream to prevent surface erosion.

The lining must be fastened in place with adhesive and with studs with washers spaced a maximum of 18 inches on center each way.

Applying Adhesive: The adhesive must be liberally applied over entire interior surfaces of ducts or plenums.

Stud Installation:

Studs must be installed as follows:

1. Cement-In-Place Type Studs: Cement-in-place type studs must be cemented in place with adhesives manufactured for this purpose and must be as recommended by the stud manufacturer. Cement-in-place type studs must be used where concrete walls form part of plenum.
2. Percussive Welding Type Studs: Percussive welding type studs must be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.

3. Pneumatic Driven Type Studs: At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies must be used under the sheet metal.

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

gpf: Gallons per flush.

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.

99-15441A(4)(b)

Not Used

99-15441A(4)(c)

Not Used

99-15441B Materials

99-15441B(1) General

Plumbing fixtures must be white, commercial grade, and of vandal-resistant design. Plumbing fixtures must comply with ASME A 112.19.2 unless otherwise specified.

Plumbing fixtures in contact with potable water must be certified under NSF 61.

Furnish plumbing fixtures with suitable fasteners to complete work. Exposed metal on fixtures, including wall flanges, bolts, nuts, and washers must be polished chrome plated. Exposed metal surfaces on fixture supports must be enameled to match fixtures.

99-15441B(2) Water Closets

Water Closets: Water closets must be ADA approved high efficiency type with no more than 1.28 gpf. Water closets must be vitreous china, siphon jet, 16 to 17-1/2 inches high, elongated bowl, close-coupled tank, and floor mounted. Water closets must be listed and labeled under the EPA "WaterSense" program.

Water Closet Seats: Water closet seats must be a solid plastic, open front, elongated seat with check hinges.

99-15441B(3) Urinals

Urinals:

> Urinals must include the flushometer, wall hangers, and appurtenances. Urinals must be ADA approved high efficiency type with no more than 0.125 gpf. Urinals must be wall hung, vitreous china, washout type, 3/4 inch topspud, integral shields, spreader, and trap. Urinals must be listed and labeled under the EPA "WaterSense" program.

Flushometers must be concealed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 3/4 inch back spud urinals. Flushometers must include a concealed infrared sensor with indicator light and manual override mounted in a box with stainless steel cover plate and vandal resistant screws. Include the manufacturers mounting plate for the box. Sensor range and time must be adjustable. Power supply must be a box mounted transformer, 120-volt AC input, low voltage AC and current output as required, and supplied by the flushometer manufacturer. Include power and control cables. Flushometers must be listed and labeled under the EPA "WaterSense" program. Transformer must be intalled in wall behind access door.

99-15441B(4) Lavatories and Sinks

Lavatories:

Lavatories must be vitreous china with ledge, grid drain with overflow, and drilled for 4-inch centers. Nominal dimensions must be 20 by 18 inches. Lavatory faucets must be single extra long lever mixing faucet complying with 24 CA Code of Regs Pt 2 § 1115B.4.3. Lavatory must be equipped with temperature controls to limit the hot water supply to 110 degrees F at a flow rate of no more than 0.5 gpm.

Lavatory supports must be concealed type, wall mounted carrier with leveling screws and locking devices. Carriers must be adjustable for type of wall. Include required hardware.

Mop Sinks: Mop sinks must be enameled cast iron, 3-inch trap, vinyl coated rim guard, vacuum breaker faucet with hose, and wall hook. Nominal dimensions must be 28 by 28 inches.

Kitchen Sinks: Kitchen sinks must be:

1. Made of commercial quality 18 gauge, Type 304 stainless steel
2. Seamless self-rimming offset dual bowl design, with one bowl 6 inches deep
3. Undercoated to dampen sound and prevent condensation
4. Equipped with 3 faucet holes at 4 inch centers and drain with 3-1/2 inch openings, off-centered
5. Disabled accessible and maximum sink depth shall be 6-1/2" inches.

Faucets for kitchen sinks must be:

1. Solid brass construction and polished chrome plate finish
2. Concealed deck mounting
3. Equipped with at least 5-1/2 inch rigid swing gooseneck spout, aerator, and wrist blade handles
4. Compliant with ASME A 112.18.1

Garbage Disposal: Garbage disposal must be:

1. 3/4 HP Dura-Drive motor with MultiGrid technology.
2. The grinding chamber must be stainless steel.
3. Sound seal technology delivers quieter.
4. Power cord and all necessary accessories must be included for proper installation, operation and maintenance.

99-15441B(5) Water Heaters

Water Heater (Tankless):

Water heatermust be natural gas operation, direct vent, wall-mounted unit with integral or remote LCD display panel, On/Off and temperature setting controls, diagnostic and repair indications. The unit must be equipped with safety features including, but not limited to, electronic spark ignition, oxygen depletion sensor, overheating limiter, flame failure safety device and pressure relief valve. The unit must be completed with concentric through the roof combustion air intake and flue vent termination kit, freeze protection, flush valve kit, condensate collector and wall mounted bracket. Combustion air intake and flue vent must be provided with a dedicated sealed vent system installed in accordance with the manufacturer's recommendation and as shown in the plans. Water heater's flue gases are under positive pressure and shall travel through a sealed gas tight, minimum 4-inch stainless steel vent pipe. The stainless steel vent pipe shall be equipped with sealing gaskets for ease of installation, proper safety and durability.

Water heaters must comply with the California *Building Energy Efficiency Standards for Residential and Nonresidential Buildings*, 24 CA Code of Regs Pt 6, and the California Energy Commission *Appliance Efficiency Regulations*.

Water heaters must comply with ANSI Z21.10.3.

Water heaters must have an energy factor of at least 95 percent.

99-15441B(6) Miscellaneous Equipment

Electric Water Coolers:

Electric water coolers must be, dual stations, bi-level, wall mounted, wheelchair accessible, with heavy duty galvanized steel frame, one-piece stainless steel top, and stainless steel cabinet. Electric water coolers must have self-closing, front and side mounted push bar actuators, shielded bubbler, and automatic stream regulator. Electric water coolers must include loose key stop, adjustable thermostat and cast brass p-trap. Compressors must be hermetically sealed, positive start with fan cooled condenser. Electric water coolers must have a 3-wire grounded cord and plug.

Electric water coolers must produce a minimum of 8 gallons of 50 degree F water per hour based on an inlet water temperature of 80 degrees F and an ambient room temperature of 90 degrees F.

Sealant: Sealant must be:

1. One component, low modulus silicone
2. Non-acid curing
3. Designed for plumbing fixture applications
4. Compliant with ASTM C 920
5. Compliant with VOC requirements of the local air district
6. Not subject to sag or flow and tack-free in 1 hour
7. Capable of 100 percent extension and 50 percent contraction without failure

99-15441C Construction

99-15441C(1) General

Seal fixtures to the wall and floor with sealant bead.

Install wall mounted fixtures on concealed carriers designed to support weight of fixture from the floor. Carriers must be made for the specific fixture to be supported and for the installation conditions.

Furnish fixtures with accessible compression stops.

Wrap hot water supply, trap and tailpiece on lavatories under section 99-15250.

99-15441C(2) Installation

Install flush valves for fixtures shown as disabled accessible so that the valve handle is on the widest side of the toilet space.

Install water closets under the manufacturer's instructions. Water closets shown as disabled accessible must be installed with disabled accessible flush valve. Install water closet seats.

Install urinals under the manufacturer's instructions.

Install transformers flushometers as shown. Install a plastic junction box extension to cover the transformer.

Install mop sink faucets on the wall above the sink-back with the spout outlet 36 inches above the floor.

Install water heaters with seismic restraints, inlet ball valve, insulating connections, and 3/4-inch pressure and temperature relief valve. Install relief valve drain pipe as shown. Water heater must be installed in accordance with the manufacturer's recommendations by a qualified installer, service agency or the gas supplier.

99-15441D 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.

Cooling and refrigeration equipment and components must be certified by AHRI for the performance rating shown, under the AHRI or ARI rating systems. Performance of space 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.

Motors: Motors must be premium type, of highest efficiency available.

99-15500A(2) Definitions

Not Used

99-15500A(3) Submittals

Product Data: Submit product literature and installation instructions for all products including ductwork and accessories. Include energy efficiency ratio (EER) and seasonal energy efficiency ratio (SEER) for cooling equipment, coefficient of performance (COP) for heating equipment, annual fuel utilization efficiency (AFUE) for gas-fired heating equipment, and type and quantity of refrigerant for each cooling unit.

Shop Drawings: For air conditioning unit , economizers, fans, dampers, and duct layout on full size sheets, drawn at same scale as the plans or larger scale as needed for clarity, but not less than 1/4 inch scale.

99-15500A(4) Quality Control and Assurance

Single Source Responsibility: HVAC equipment in each of the following categories must be the products of a single manufacturer:

1. Heating and cooling units
2. Fans and ventilators
3. HVAC controls
4. Ductwork
5. Diffusers, registers, and grilles
6. Dampers
7. Air filters

99-15500B Materials

99-15500B(1) Heating and Cooling Units

Combination Heating/Cooling Rooftop Unit Combination Heating/Cooling Rooftop Unit must be high efficiency, commercial quality, single package, roof curb mounted unit with weatherproof acoustically lined cabinet. Unit must have anti-short cycle timer, colored and numbered wiring, low voltage terminal board, , filters, foil-faced and edge captured insulation, high pressure control, removable drain pans, liquid line refrigerant drier, low pressure control, operating charge of R-410A refrigerant, phase loss protection / balancer, stainless steel heat exchanger, through the base; gas, electrical, and disconnect switch, hinged access doors, return air sensor, filter status, powered convenience outlet, economizer, supply and return air smoke detector,motorized outside air damper, powered exhaust, roof curb, two stage heating, supply and return air smoke detectors.

Unit must be provided with positive pressure combustion and mechanical flue gas venting and furnace safety controls.

Compressor must be direct-drive, hermetic, scroll type, vibration isolated, short cycling protection, pressure relief valve, high and low pressure switches, liquid-line filter-dryer.

Indoor air blower must be adjustable V-belt drive type. The fan and fan motor must provide the specified air flow, with wet coil, against the external static pressure as noted on the plans.

Motors must have integral thermal overload protection.

Unit must be provided with an economizer and modulating exhaust fan.

Economizer: Economizer must be modulating type assembly provided by the manufacturer. The economizer must be complete with damper motor and linkage for full range modulation of the outdoor and return air dampers, modulating exhaust fan, screened rain hoods, factory wiring for convenient connections, automatic compressor lockout, minimum position damper control, and air filters sized to have a maximum velocity of 400 feet per minute, all installed in an enclosure similar in color to the basic unit. Modulating exhaust fan must be capable of relieving 100 percent of the rated air conditioning unit. The economizer must be constructed to meet SMACNA requirements and shop drawings must be submitted prior to fabrication. Economizer controls must be fully integrated with cooling system controls.

99-15500B(2) Fans and Ventilators

Exhaust Fan (Ceiling Mounted): Exhaust fan must be ceiling mounted, centrifugal type, AMCA certified and must be equipped with grille, backdraft damper and minimum 0.033-inch thick (20 gauge) galvanized steel housing with acoustical insulation. Exhaust fan motor must have permanently lubricated sealed bearings, integral thermal overload protection and disconnect plug, mounted on vibration isolators. Ceiling exhaust fan must be Loren Cook Company, Greenheck Fan Corp., ACME, or equal.

99-15500B(3) HVAC Controls

Thermostat (Office Only): Thermostat must be 24-volt, 7-day programmable, electronic heating/cooling thermostat, with the ability to program the fan-on mode during normal working hours, and fan-off mode during unoccupied periods. Thermostat must be provided with sub-base selector switches for "…..AUTO-….. HEAT-OFF-COOL" and fan "AUTO-ON". Thermostat must be auto-changeover type, and have full temperature range setback capacity. Thermostat must be Robertshaw; Honeywell, or equal.

99-15500B(4) Auxiliary HVAC Components

Unless specified herein, all components must be sized and have the characteristics as shown.

Rigid Ductwork: Rigid ductwork must be galvanized steel sheet metal complying with ANSI/SMACNA 006, "HVAC Duct Construction Standards—Metal and Flexible." Galvanized steel must be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

Spiral Duct: Spiral duct must be prefabricated type.

Duct Supports: Duct supports must be hot-dip galvanized steel.

Supply Diffuser (for Gypsum Board and Suspended Ceilings): Diffuser for gypsum board and suspended ceilings must be square type. Diffuser must be steel with oven baked-on enamel bone white dull finish or extruded aluminum, equipped with a removable core and a standard flanged frame with sponge rubber or felt gasket. Diffuser must have individually adjustable curved blades, counter-sunk screw holes, must be surface mounted, with face velocity less than 600 feet per minute; Titus, Hart and Cooley; or equal.

Return Register (for Gypsum Board and Suspended Ceilings): Return register for gypsum board and suspended ceilings must be square, and must be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45 degrees, ½-inch spacing maximum, surface mounted; Titus; AirMate; or equal.

Supply Diffuser (for exposed ductwork): Supply diffuser for exposed ductwork square. Diffuser must be steel with oven baked-on enamel dull finish to match duct color or extruded aluminum, perforated face hinged for easy access, and must be fitted with fully adjustable air pattern controllers, and a standard flanged frame; Titus; AirMate; or equal.

Return Register (for exposed ductwork): Return register for exposed ductwork must be exposed diffuser type. Return register msut be steel with oven baked-on enamel dull finish to match duct color or extruded aluminum, perforated face hinged for easy access, and shall be fitted with fully adjustable air pattern controllers, and a standard flanged frame.

Volume Damper: Volume damper must be opposed blade type, operable from face with screwdriver or Allen-head wrench, must be same manufacturer as diffuser or may be furnished as part of the diffuser.

Balance Damper: Balance damper must be butterfly type, 16-gage (minimum) galvanized steel blade, end bearings with steel shaft and locking and indicator operator.

Air Filter (for HVAC Units): Air filters must be disposable filters with a minimum efficiency reporting value (MERV) of not less than 13 when tested under ASHRAE 52.2. Filters must be located to process both return and outside air that is delivered as supply air.

Vents and Flues (for Heaters): Vents and flues for heaters must be approved Type B or approved plastic vents for condensing furnaces.

Condensate Drain Piping: Condensate drain piping must be rigid, Type L copper tubing with brazed solder fittings.

99-15500C Construction

99-15500C(1) Installation

Heaters:

Furnacesmust be installed in such a manner as to insure adequate furnace clearance and separation of combustion air and circulating air. Appliances must be connected to a rigidly mounted gas pipe supply system by a CSA approved flex connector and gas valve.

Ventilators:

Exhaust ducts connected to exhaust fans must be routed as shown and must terminate in a weatherproof cap and bird screen. Duct sizes must be as shown or as recommended by the manufacturer, whichever is larger.

Condensate Drains: Air conditioning unitmust be provided with condensate drain trap and piping. Outdoor piping must extend to the nearest roof drain, gutter or as shown. Air gap must be installed where required by code. Interior condensate drain piping must be insulated with foam insulation.

Mounting Heights: Thermostats must be installed as consistent with accessibility requirements.

Temperature Controls:

Install thermostats on interior walls as shown in the plans.

Air Outlets: Volume dampers must be furnished and installed for all diffusers. Blocking must be provided on all sides of air outlets between ceiling or wall joists. Collars must be supplied for all outlets and must be taped and sealed in place.

Vents and Flues: Vents and flues must be securely fastened to the building construction, must be provided with a collar at all ceiling penetrations and must terminate with a weather cap fabricated of the same material.

Access Door: Access doors must be provided in rigid ducts and plenums for access to volume dampers, fire dampers and control devices located within such ductwork; and must be provided at such other locations as shown.

Ducts and Vents:

Ductwork within the building must be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork must preserve head room and must keep openings and passageways clear whether shown on plans or not.

Ductwork must be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards—Metal and Flexible."

Slopes in sides at transitions must be approximately one to five. The ductwork system must not contain abrupt changes or offsets of any kind unless otherwise shown.

Where ducts pass through walls, or ceilings, galvanized sheet metal or steel angle collars must be installed around the ducts.

Duct sections must be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections must be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections must be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums must be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings must be sealed with sealant and taped.

Ductwork Identification:

Ductwork must be identified as follows:

Duct Description	Identification Symbol
Supply duct	S
Return duct	R
Exhaust duct	EXH

Identification symbol letters must be stenciled at locations visible from the access routes to be used by maintenance workers. Such letters must be painted with black colored paint and must be a minimum of 2 inches high.

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.

In each system, at least one air path, from fan to final outlet, must have all balance dampers open. The final air quantities must be achieved by adjusting the volume dampers or the fan RPM.

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 air systems must be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work must be done in collaboration with the control manufacturer's representative.

Project Completion Tests:

The Engineer must be notified at least 5working days in advance of starting project completion tests.

The project completion tests must consist of the following:

1. Air Systems: All air systems must be tested and balanced to the conditions set forth on the plans and in these special provisions. This work must be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified contractor. The air systems include, but are not necessarily limited to, the following:

    a. Supply air systems
    b. Return air systems
    c. Exhaust air systems

2. Operational Data: The tests must include operation of the heating, cooling, and ventilating systems for not less than two 8-hour days, each system must operate at not less than 90 percent of their full specified capacities.

    The required data must be accurately measured. The data must be measured during one operational cycle in the presence of the Engineer and must be submitted for authorization.

    The following data must be measured and tabulated:

    a. Ambient temperatures and conditions, °F
    b. Supply and return air quantities, CFM, each room
    c. Thermostat set point, °F
    d. Air temperatures at room center, °F
    e. Fan motor amperages and voltages
    f. System static pressures, inches of water column

99-15500D 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 86-1.02and 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 electrical systems has been completed, each electrical system must be tested in the presence of the Engineer to demonstrate that the electrical systems function properly. You must make necessary repairs, replacements, adjustments and retests at your expense.

Final inspection for the completed electrical system must take place after all the various systems have been tested. A punch list will be generated by the Engineer after inspecting each electrical system and you must make necessary repairs, replacements, and adjustments for all the items listed in the punch list at your expense.

The Engineer must be notified 15 days in advance of testing and State personnel training on the job site. When a manufacturer's representativeis required on the job site, the Engineer must be notified 15 days in advance.

99-16010D Payment

Not Used

99-16050 BASIC MATERIALS AND METHODS

99-16050A General

99-16050A(1) Summary

Scope: This work consists of furnishing and installing the basic materials for the electrical work, including conduits, conductors, fittings, and wiring devices. The basic materials must include those accessories and appurtenances, not mentioned, that are required for the installation and operation of the electrical system.

Related Work:

Roof penetrations must be flashed and sealed watertight to comply with section 99-07620.

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 cutswith exact part number and data (voltage, phase, and rated amperes or watts or horsepower), complete description, performance data and installation instructions for the materials and equipment.

99-16050A(4) Quality Control and Assurance

Not used.

99-16050B Materials

99-16050B(1) Conduits and Fittings

Rigid Steel Conduit and Fittings:

Rigid steel conduit must be Type 1 complying with section 86-2.05A.

Type 1 conduit must have steel or malleable iron fittings.

Split or three-piece couplings must be electroplated, malleable cast iron couplings.

Insulated grounding bushings must be threaded malleable cast iron body with plastic insulated throatand steel, lay-in ground lug with compression screw.

Insulated metallic bushings must be threaded malleable cast iron body with plastic insulated throat.

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.

Couplings must be PVC, socket type or thread on one end and socket type on the other end as required for the particular application.

Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system must be PVC adapters with threads on one end and socket type on the other end.

Liquidtight Flexible Metallic Conduit and Fittings:

Liquidtight flexible metallic conduit must be Type 4 complying with section 86-2.05A.

Fittings must be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

99-16050B(2) Cables and Conductors

Conductors:

Conductors must be stranded copper wire of the size shown. Conductors must comply with ASTM B3 and ASTM B8. Conductor size must be based on AWG, except that conductor diameter must be not less than 98 percent of the specified AWG diameter.

Conductor insulation types must be as follows:

1. Conductors in control panel enclosures must be Type MTW.

2. Conductors in wet, underground, or outdoor locations must be Type XHHW-2.
3. All conductors other than Type MTW and XHHW-2 must be Type THHN.

Wire Connections and Devices: Wire connections and devices must be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

99-16050B(3) Electrical Boxes

Outlet, Device and Junction Boxes:

Boxes must be galvanized steel boxes with knock-outs and must be the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches square by 1-1/2 inches deep. Flush-mounted single device and surface mounted light fixture boxes must have four inch square single raised device covers.

Flush-mounted boxes must have stainless steel covers, 0.04 inches thick. Surface-mounted boxes must have galvanized steel covers with metal screws. Cover screws must be metal with finish to match cover finish.

Sectional device plates will not be permitted.

Cast boxes and weatherproof boxes must be cast iron boxes with threaded hubs complying with NEMA FB-1, and must be of the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches square by 1-7/8 inches deep.

Cast boxes and weatherproof boxes must have cast iron covers with gaskets.

Weatherproof device boxes must have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Pull Boxes:

Pull boxes must comply with section 86-2.06.

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." Telephone pull box covers must be marked "COMMUNICATION."

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.

Management Information System (MIS) Receptacle: MIS receptacle must be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, isolated ground, orange color, specification grade duplex receptacle suitable for wiring with stranded conductors.

99-16050B(5) Occupancy Sensor Switches

Not used.

99-16050B(6) Miscellaneous Materials

Warning Tape: Warning tape must be 4 inches wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 3/4-inch black letters at 30-inch intervals on bright orange or yellow background. The printed warning must be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape must have a tensile strength of not less than 155 pounds per 4-inch wide strip and must have a minimum elongation of 700 percent before breaking.

Pull Rope: Pull rope must be nylon or polypropylene with a minimum tensile strength of 1800 pounds.

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:
   - 1.1. EMT may be used in walls and furred spaces and for exposed work indoors above the switch height.
   - 1.2. Flexible metallic conduit must be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.
   - 1.3. Liquidtight flexible metallic conduit must be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet or exterior locations.
   - 1.4. PVC coated rigid steel conduit must be usedfor allbase elbows and vertical risers through concrete slabsinside and outside the building.
   - 1.5. Rigid non-metallic conduit must be used in underground, exterior locations.
   - 1.6. Rigid non-metallic conduit must be used in underground and underslab locations inside the building only at locations where the PVC symbol are shown. All base elbows and vertical risers must be PVC coated steel conduit.
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.
14. All raceway systems run on the I-beams and vertical columns must be secured using fasteners, clamps and hangers without drilling holes on the structure.

Conduit Terminations:

Rigid steel conduits must be securely fastened to cabinets, boxes and gutters using 2 locknuts and insulating metallic bushing. EMT must be securely fastened to cabinets, boxes and gutters using connectors. Conduit terminations at exposed weatherproof and cast boxes must be made watertight using hubs.

Grounding bushings with bonding jumpers must be installed on all conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduit must be terminated inside the underground pull boxes with an authorized conduit bushing or fitting. All conduits must enter vertically through the bottom of pull boxes.

All future conduits terminated in underground pull boxes or left exposed indoors and outdoors must be provided with watertight conduit plugs.

Warning Tape: Warning tape must be placed over each conduit in a trench. Each warning tape must be centered over the conduit and must be placed over the 6 inch layer of sand covering the conduit.

Conductor and Cable Installation:

Conductors must not be installed in conduits until all work of any nature that may cause injury is completed. Care must be taken in pulling conductors so that insulation is not damaged. An authorized non-petroleum base and insulating type pulling compound must be used as needed.

All cables must be installed and tested to comply with manufacturer's instructions.

Splices and joints must be insulated with insulation equivalent to that of the conductor.

Six inches of slack must be provided at each outlet and device connection. If the outlet or device is not at the end of a run of conductor, connection must be made with correctly colored pigtails tapped to the runs with splices.

All pressure type connectors and lugs must be retightened after the initial set.

Splices in underground pull boxes and similar locations must comply with section 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 (grounded) 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 over its entire length. Isolated equipment grounding conductors for MIS receptacles must begreen 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
120/208 volt-Three phase	Black, red, blue

Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code must be used for the entire length of the circuit.Conductors with gray insulation must not be used as ungrounded circuit conductors and/or for wiring control panels and stations.

Where more than one branch circuit enters or leaves a conduit, panelboard, control panel, control station, 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.

Outlet boxes installed on I-beams and vertical columns must be secured using fasteners, clamps and hangers without drilling holes on the structure.

Pull Box Installation:

Pull box installation must comply with section 86-2.06C and the following:

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’-8"
Wall switches	3’-8"
Convenience outlets	1’-6”
Electric water cooler outlet	As recommended by the water cooler manufacturer.
Communication outlets	1’-6”

99-16050D Payment

Not Used

99-16420 SERVICE AND DISTRIBUTION

99-16420A General

99-16420A(1) Summary

Scope: This work consists of furnishing and installing distribution equipment.

99-16420A(2) Definitions

Not Used

99-16420A(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 complete description, performance data and installation instructions for the materials and equipment.

99-16420A(4) Quality Control and Assurance

Not Used

99-16420B Materials

Distribution Circuit Breaker:

Distribution circuit breaker must be 3-pole, 240-volt, 225-ampere frame, 250-ampere trip, molded case circuit breaker with AC magnetic trip adjusted to 2000 amperes. The interrupting capacity of the circuit breaker must be 65,000amperes (symmetrical) at 240 volts.

99-16420C Construction

Distributioncircuit breaker must be installed inside exisitng distribution section as shown.Distribution circuit breakermust match existing type. Provide mounting hardware, bus straps, and related materials for proper circuit breaker installation. Provide new identification nameplate with designation as shown. Provide new typewritten circuit directory reflecting changes.

99-16420D Payment

Not Used

99-16432 ELECTRICAL EQUIPMENT

99-16432A General

99-16432A(1) Summary

Scope: This work consists of furnishing and installing panelboards, disconnect switches, and related accessories.

Related Work: Anchorage devices must comply with section 99-16050.

99-16432A(2) Definitions

Not Used

99-16432A(3) Submittals

Product Data:

Submit a list of materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials and equipment. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. Working drawings submitted must be 34 by 22 inch size.All control and power conductors on the shop drawings must be identified with wire numbers. Any other data as requested by the Engineer must also be submitted for approval.

99-16432A(4) Quality Control and Assurance

Not Used

99-16432B Materials

99-16432B(1) Panelboards

Panelboards must be factory assembled with hinged door and molded case circuit breakers as shown.Panelboards voltage ratings, capacity rating and short circuit current ratings (SCCR) must be as shown on the plans.Panelboards must be designed, manufactured and tested in accordance with UL 67 (Panelboards),UL 50 (Cabinets and boxes) and NEMA PB1 (Panelboards).Unless otherwise shown on the plans, panelboards must be fully rated.Main bus bars must be copper.Panelboards with neutrals must have full-size (100 percent) insulated groundable neutrals.Panelboards must have door-in-door trim.Both hinged trim and trim door must utilize a 3-point latching.

PanelboardD: PanelboardD must be indoor type, surface-mounted, factory assembled with integrated branch circuit monitoring and integrated power and energy meter, 3-phase, 4-wire, 120/208-volt, AC panelboard at least 20 inches wide with 225-ampere main breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Power and energy meter must have backlit LCD display. Power and energy meter must be programmable, revenue grade with capability of monitoring voltage, amperage, power and energy for all branch circuits and for main breaker with accuracy of ANSI 12.20 0.5%. Power and energy meter must have modbus RS-485 communication output port and datalogging capabilities. Provide integrated current transformers, potential transformers, shorting terminal blocks and fuses as required for branch circuit monitoring.

99-16432B(2) Starters

99-16432B(3) Switches

Air Conditioner Disconnect Switch: Air Conditioner Disconnect switch must be 3-pole, 240-volt, AC, 30-ampere, fused, general duty safety switch in a NEMA-3R enclosure. The fuses must be sized to suit the air conditioning unit furnished.

99-16432B(4) Transformer

Not Used

99-16432B(4) Miscellaneous Materials

Nameplates: Nameplates must be laminated phenolic plastic with white core and black front and back. Nameplate inscription must be in capitals letters etched through the outer layer of the nameplate material.

Warning Plates: Warning plates must be laminated phenolic plastic with white core and red front and back. Warning plates inscription must be in capital letters etched through the outer layer of the nameplate material.

Device Labels: Device labels must be industrial type, preprinted labels with adhesive backed white core and black front and back.Device labels must resist fading, scratching, moisture, heat, chemicals, ultraviolet (UV) exposure and cleaning fluids. Device labels must be K-Sun Labels;DymoLetra Tag or equal.

Plywood Backing Board: Plywood backing board for mounting electrical or telephone 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.

Panelboard Installation:

Set cabinets plumb and symmetrical with building lines. Train interior wiring to comply with "Conductor Installation" in section 99-16050. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.

Mounting height must be 5½ feet to the highest circuit breaker handle, measured above the finished floor.

Where “Space" is shown, branch connectors, mounting brackets, and other hardware must be furnished and installed for future breaker.

A typewritten directory under transparent protective cover must be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker must include complete information concerning equipment controlled, including room number or area as shown.

Equipment Identification:

Equipment must be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions must read as follows:

Item	Letter height, inches	Inscription
Panel D	1/2	PANEL D, 120/208 V, 3 PH, 4W
Air Conditioner Disconnect Switch	1/4	AC DISCONNECT
Telephone Terminal Board	1/4	TELEPHONE TERMINAL BOARD
Lighting Control Station	1/4	LIGHTING CONTROL STATION

Receptacle Outlets Device Labels: Device labels for receptacle outlets must be the voltage, phase (except 120-volt circuits), branch circuit breaker ampere rating, panelboard's circuit number. GFCI protected receptacles must include the inscription that reads “GFCI PROTECTED” on the label. Controlled receptacles must include the inscription that reads "CONTROLLED RECEPTACLE": Receptacle outlets device labels must read as in the following example; 120V, 20 A, G19, GFCI PROTECTED.

Warning Plates:

Warning plates must be attached to designated equipment with self-tapping cadmium-plated screws or nickel-plated bolts.

99-16432D Payment

Not Used

99-16500 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 for lighting control station.

Closeout Document Submittals:

Submit closeout documents for the following equipment before completion of the project:

1. Outside Lighting Control Station

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 you for correction and resubmittal.

99-16500A(4) Quality Control and Assurance

Regulatory Requirements:

To comply with requirements of Nonresidential Building Energy Efficiency Standards as described in California Title 24, 2013, the State must receive the following properly filled out and signed forms by You as the responsible person before the building can receive final occupancy:

A. Certificate(s) of Installation Forms:

1. Validation of Certificate of Compliance (Form NRCI-LTI-01-E)
2. Energy Management Control System or Lighting Control System (Form NRCI-LTI-02-E)
3. Power Adjustment Factors (Form NRCI-LTI-05-H)
34. Outdoor Lighting (Form NRCI-LTO-01-E)
45. Lighting Controls Systems (Form NRCI-LTO-02-E)
6. Sign Lighting (Form NRCI-LTS-01-E)

Certificate(s) of Installation forms, preparation and signature responsibility resides with the specialty subcontractor who provided the installation services related to the forms listed above.

B. Certificate(s) of Acceptance Forms:

1. Lighting Controls (Form NRCA-LTI-02-A)
2. Automatic Daylight (Form NRCA-LTI-03-A)
3. Demand Responsive Controls (Form NRCA-LTI-04-A)
24. Outdoor Motion Sensor and Lighting shut-off Controls (Form NRCA-LTO-02-A)

Certificate(s) of Acceptance forms must be performed and signed by a certified technician, who is certified by an Energy Commission approved Acceptance Test Technician Certification Provider (ATTCP), at no additional cost to the State. The certified technician is required to confirm that the Certificate(s) of Installation has been properly completed and signed as a prerequisite to issuance of Certificate(s) of Acceptance.

Installer Qualifications:

The subcontractor or installer selected must be certified or trained by the manufacturer of the products, adhere to the engineering, installation and procedures of the manufacturer of the products and utilize authorized manufacturer components. The subcontractor or installer must complete the required Certificate(s) of Installation forms and Certificate(s) of Acceptance forms as listed above.

Commissioning: Comply with section 10-2.02, and coordinate with commissioning agent to carry out commissioning of lighting systems.

99-16500B Materials

99-16500B(1) General

Lighting Fixture Lamps: Lighting fixture lamps must be type and size as shown as described.

Lighting Fixtures: Lighting fixtures must be as shown. Outdoor luminaires must be listed and labeled "Fixture Suitable For Wet Locations."

LED1: Surface mounted, 24"X48" LED troffer, 50 Watt and 120 Volt LED engine lamp, 4000 minimum delivered lumens at 3500 degree Kelvin, minimum CRI of 80 and minimum delivered L80 performance of 50,000 hours. The fixture must have linear faceted reflector cavity, sloped end plates and advanced optical film. The fixture must be constructed from one-piece cold-rolled steel coated polyester, painted, complete with a single clear acrylic diffuser to provide LED engine concealment and wide distribution. AC LED engine driver must be UL listed, 0-10Volt dimming, 0.9 minimum power factor, complete with internal thermal protection and overload protection.Fixture must come with mounting adapters and hardware required for surface mounting to gypboard type ceiling or recess mounting to suspeded type ceiling as shown.Fixture photometric must be tested in accordance to IESNA LM-79. LED1 fixtures with emergency LED driver as shown on the plans must have a factory installed self-contained emergency driver that

works with AC LED engine driver to convert fixtures with LED engine into emergency lighting fixtures. The unit must consist of a battery charger and electronic circuitry in one compact case. The driver must consist of two field-replaceable, high temperature, maintenance-free nickel-cadmium batteries. The unit must include a charging indicator and test switch. Emergency driver must be able to operate the LED fixture for minimum of 90 minutes at reduced wattage of 22 Watt. The unit must be compatible with LED engine, UL listed and must be rated for 120Volt, AC. The fixture must be Lithonia, 2VTL4 series or CREE, CR24 series or equal.

LED2: Wall mounted outdoor LED luminaire, 200 Watt, 120 Volt LED array lamp, type four medium distribution, full cutoff luminaire, 7000 minimum delivered lumens at 5700 degree Kelvin and with minimum CRI of 70. The fixture must be slim low-profile design, constructed from one piece die-cast, rugged aluminum with integral, weathertight, LED engine driver compartments and high performance aluminum heat sinks. All exposed die-cast surface must have a epoxy primer to provide resistance to corrosion and white powder topcoat. LED engine driver must be UL listed, 120V, minimum delivered L70 performance of 150,000 hours, 0-10Volt dimming drive, 0.9 minimum power factor, complete with internal thermal protection and overload protection.The fixture must be equipped with integral motion sensor. Integral motion sensor must be a factory installed motion sensor on the fixture housing and uses passive infrared technology to detect motions. Motion sensor coverage must be equal or greater than 2 mounting height diameter coverage with a 360 Degree circular pattern. Motion sensor must dim the fixture light output by 50% when there is no motion detected.Fixtures must be UL listed for wet location and IP66 rated. The fixture must be BETA LED the EDGE, wall pack series or Philips Gardco, P21 series or equal.

LED3: Wall mounted outdoor LED luminaire, 100 Watt, 120 Volt LED array lamp, type four medium distribution, full cutoff luminaire, 7000 minimum delivered lumens at 5700 degree Kelvin and with minimum CRI of 70. The fixture must be slim low-profile design, constructed from one piece die-cast, rugged aluminum with integral, weathertight, LED engine driver compartments and high performance aluminum heat sinks. All exposed die-cast surface must have a epoxy primer to provide resistance to corrosion and white powder topcoat. LED engine driver must be UL listed, 120V, minimum delivered L70 performance of 150,000 hours, 0-10Volt dimming drive, 0.9 minimum power factor, complete with internal thermal protection and overload protection.The fixture must be equipped with integral motion sensor. Integral motion sensor must be a factory installed motion sensor on the fixture housing and uses passive infrared technology to detect motions. Motion sensor coverage must be equal or greater than 2 mounting height diameter coverage with a 360 Degree circular pattern. Motion sensor must dim the fixture light output by 50% when there is no motion detected.Fixtures must be UL listed for wet location and IP66 rated. The fixture must be BETA LED the EDGE, wall pack series or Philips Gardco, P21 series or equal.

Exit Sign: Wall mounted, LED lighted exit sign with supply voltage of 120 Volt. The exit sign must be white, compact, low-profile, engineering grade thermoplastic housing, corrosion proof complete with an integrated test switch and visible red pilot light. The exit sign must have a sealed and maintenance-free nickel-cadmium battery. "EXIT" letter color must be green. The exit sign must be Lithonia LED Exits series or Navilite NXPA series or equal.

Emergency Exit Light: Wall mounted, emergency exit light with supply voltage of 120 Volt, Dual LED lamp head, each lamp head must have a 5.4 Watt LED array. The fixture must be white, compact, low-profile, engineering grade thermoplastic housing, corrosion proof complete with an integrated test switch and visible red pilot light. The fixture must have a sealed and maintenance-free nickel-cadmium battery. The fixture must be Lithonia ELM2 series; Navilite NXPCL series or Compass Lighting Products CCG series or equal.

Ceiling Mounted Occupancy Sensor, Type 1: Ceiling mounted occupancy sensor, Type 1must be a low voltage, dual technology (passive infrared and microphonics detection) sensor switch with two interval time delay and must be Title 24 compliant. Sensor must be white in color. The switch must be capable of detecting 36ft radial coverage when mounted at 15 feet above finished floor. The sensor must have LED indicator that remains active at all times in order to verify detection within the area to be controlled.

Sensor must have no leakage in the "OFF" mode. The time delay off setting must be adjustable from 30 seconds to 30 minutes, initially set at 30 minutes

Power Pack: Power pack must be a combination 15 to 24 volts DC power supply and 16 to 20 ampere line voltage switching relay to switch LED drivers. Power pack must be a self-contained transformer with 15 to 24 volts DC and minimum 70 to 110 mA output.Input voltage to power pack unit must be suitable for 120/277 volts. Power pack must be Title 24 compliant and must be able to provide power to all the loads connected to it. Power pack must be white in color and must have a green LED indicator. Power pack unit, occupancy sensor and all the lighting control devices must be from the same manufacturer.Power pack unit must be mounted inside a properly sized junction box. Power pack used in switching lights and plug loads must be equipped with two 20-ampere rated integrated relays.

Dimming Switch: Dimming switch must be a low voltage, corrosion resistant wall mounted ON/OFF plus RAISE/LOWER switch that can control the 0 to 10 V(dc) dimmable LED drivers.Switch must be able to communicate with the other lighting control devices. Power for the switch must be provided by the power pack.Switch must have soft click pushbutton control and single channel of control.Switch must have single on/off, single dimming raise/lower pushbuttons and LED feedbacks.Switch must be ivory in color and must be installed in a wall mounted device box with single raised device cover.

Control Conductors or Cables: Control conductors or cables must be as recommended by the light fixture and control equipment manufacturer.

Photoelectric Unit, PEU: Photoelectric unit must be cadmium sulfide photoelectric control with capacity of 1200-watt incandescent or 1800-watt inductive or fluorescent load, mounting adapter, and EEI-NEMA twist lock receptacle; Fisher, Pierce, Ripley, or equal.

Outside Lighting Control Station, OLCS: Outside lighting control station must consist of a time clock, lighting contactor, selector switch, snap switch, neutral bar, ground bar, terminal block, nameplates, and pilot light in a surface mounted NEMA-12 enclosure with a hinged door.

Lighting Contactor, LC: Lighting contactor must be electrically held, combination lighting contactor with 120-volt AC coil and 30-ampere, double-break, silver alloy contacts; Square D Company, Eaton Cutler-Hammer, Siemens, or equal. Number of poles must be as shown.

Selector Switch, SS: Selector switch must be rotary action, double-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 plate marked HAND-OFF-AUTO.

Pilot Light, PL: Pilot light must be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with green domed cap.

Time Clock: Time clock must:

1. Use 120 volts.
2. Be an astronomical time switch device.
3. Have power on-off manual override.
4. Have programming ability to:
   a. Run at least four independent schedules for any days of the week.
   b. Skip selected days.
5. Have single pole, double pole normally open contacts rated 20 amperes, 120 volts, AC.
   a. Number of poles: As shown.
6. Have a non-volatile memory that requires no back-up.

Ground Bar, GB: Ground bar must be 100-ampere copper ground bar with circuit taps.

Neutral Bar, NB: Neutral bar must be 100-ampere copper neutral bar with circuit taps.

Terminal Block, TB: Terminal block must be 50-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic must have a high resistance to heat, moisture, mechanical shock, and electrical 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.

Snap Switch, S_p: Snap 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.

Concrete: Concrete must comply withsection99-3. The concrete must be commercial quality portland cement concrete containing not less than 564 pounds of cement per cubic yard.

99-16500B(2) Fabrication

Component Mounting:

No equipment or device must be mounted on the side or at the bottom of the outside lighting control panels. A minimum of 6 inches of empty space must be provided at the bottom of the panel for bundling and terminating field conductors.

All components mounted inside the outside lighting control panel must be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.Nameplates must be abbreviation used on the plans.

The following electrical components must be mounted on the interior mounting panel of the Outside Lighting Control Station enclosure, OLCS:

1. Terminal block, TB
2. Lighting contactor, LC
3. Time clock
4. Neutral bar, NB
5. Ground bar, GB

The following electrical components must be mounted on the hinged door of the Outside Light Control Station enclosure, OLCS:

1. Selector switch, SS
2. Pilot light, PL
3. Snap switch S_p

99-16500C Construction

99-16500C(1) Installation

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.

Provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.Pendant mounted fixtures must be securely supported with at least two wires to the building framing in addition to the standard mounting methods for seismic safety. Fixtures must be set at the mounting heights shown, except heights shown must be adjusted to meet conditions.

99-16500C(2) Warranty

The manufacturer must provide for all the light emitting diode luminaires a written warranty for the performance of the luminaires and against defects in materials and workmanship for the luminaires for 60 months after acceptance of the luminaires.Replacement luminaires must be provided promptly after receipt of failed luminaires at manufacturer expense.The State pays for shipping the failed luminaires to the manufacturer.

Photoelectric Unit Installation:

Install photoelectric unit PEU above the roof to comply with the manufacturer's instructions and facing north. The exact location must be authorized by the Engineer.

99-16500D Payment

Not Used

99-16700 COMMUNICATION SYSTEM

99-16700A General

99-16700A(1) Summary

Scope: This work consists of furnishing and installing a complete and operational communication system in accordance with the details shown on the plans and these special provisions.

Related Work:

Basic materials, including cable identification and anchorage devices, must comply with section 99-16050.

Nameplates and device plates must comply with Section 99-16432.

99-16700A(2) Definitions

Not Used

99-16700A(3) System Description

The communication system must include a voice system and data system as shown on the plans and specified in these special provisions.

The systems must include all materials, whether mentioned or not, but are necessary for the complete, operational and tested communication system.

99-16700A(4) Submittals

Product Data:

A list of all materials and equipment to be installed and the manufacturer's descriptive data must be submitted for approval.

Manufacturer's descriptive data must include catalog cuts with exact parts number (number of ports, type of cable, mounting methods and accessories) clearly identified, complete description, performance data and installation instructions for the materials and equipment specified herein.

Closeout Submittal:

Closeout documents must be furnished for the following equipment prior to completion of the project:

1. Communication Cables
2. 110 Blocks
3. Patch Panels
4. Communication Rack

Each closeout document must contain the following information:

1. Parts list.
2. Operating instructions.
3. Maintenance instructions.
4. Wiring schematics.

99-16700A(5) Quality Control and Assurance

The installer selected to install the communication system must be certified by the manufacturing company in all aspects of design, installation and testing products described herein and must have a minimum of 5 years experience on similar structured cabling systems (SCS).The installer must possess a valid C-10 or C-7, "General Communications Cabling License," issued by the State of California, Department of Consumers Affairs, Sate Contractor's License Board.Evidence of the license is required as part of the submittal.

The installer must be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize authorized manufacturer components.

99-16700B Materials

99-16700B (1) Communication cables

Data Cable and Voice Cable:

Data cable and voice cable must be Category 5e, 4 pair, 24-AWG, UTP cable with maximum outer jacket diameter of 0.22 inch.Cable must be in conformance with the requirements in ANSI/TIA-568, "Commercial Building Telecommunication Cabling Standards."Data cable must be colored blue.Voice cable must be colored white or ivory.Plenum cable must be rated for plenum use and riser cable rated for riser use.Cable must be by Siemon; CommScope: or equal.

25 Pair Telephone Cable: 25 pair telephone cable must be 24-AWG, unshielded twisted pair (UTP), solid copper conductor cable with Cat 5e, MPR/CMR designation and polyvinylchloride insulation jacket.

99-16700B(2) Patch Panels

Patch Panels: Patch panels must be as described below.

Fiber Patch panel: Fiber patch panel must be a 625 series pre-loaded panel for multi-mode, 6-SC duplex (12 fibers) multimode cables, 19" rack mountable, beige adapters, with phosphor bronze alignment sleeves.Fiber patch panel must be by LeGrande-Ortronics, catalog number OR-625MMC-12PD1RB or Primus Cable, Catalog FB11-2841-12C/RL; or equal.

48 port Data and Voice Patch panels: 48 port data and voice patch panels must be a 19" rack mountable patch panel with 48 ports of 4-pair 8P8C that are CAT5E and TIA-568 certified, and take up 2 unit space. Category 5E, 48 port patch panel must be :LEVITON, Catalog number 5G596-U24, or Siemon, catalog number HD5-24; or equal.

99-16700B(3) Communication Rack Enclosure Cabinet and 110 Blocks

Communication rack enclosure cabinet and required accessories must be as described below.

Communication Rack Enclosure Cabinet must be, lockable, with ventilated door, with top and bottom cable access openings, with adjustable rackmount rails and mounting depths, 8 unit high wall mounted enclosure cabinet by Leviton or Tripp lite. Provide all the required mounting hardware as recommended by the manufacturer.

Communication 110 Blocks and required accessories must be as described below.

110 Mounting Bracket must be brackets used to organize and manage 110 blocks at one convenient location.They must be 35" long, black color mounting bracket for 18 blocks (2 rows of 9) with U-shaped cable loops to route jumper cables between blocks, by Chatsworth, catalog number 11188-701 or Siemon, catalog number CC-2025-TB-DC; or equal.

Clips must be bridging clips for 110 connecting blocks, by LEVITON, catalog number 40067-0BC or Siemon, catalog number SA1-SS-1000; or equal.

110 Block must be a 110 Block with split M-Block, having 25 pair on 1 side and 25 pair on the other side, using bridging clips to join pairs on either side, dimensions 10" H x 3 5/16 " W x 1 3/16 " D, by LEVITON, catalog number 40066-M50 or Siemon, catalog number M1-50; or equal.

Hinge Cover must be a hinged cover for 110 blocks, orange color, dimensions 10" H x 2 7/16 " W x 3/4 " D, by LEVITON, catalog number 40050-MH0 or Siemon, catalog number MC4LH-9; or equal.

Bracket for 110 Blocks must be bracket for 110 blocks and connector mounting, by LEVITON, catalog number 40089-00D or Siemon, catalog number, S89D; or equal.

99-16700B(4) Communication Outlet, And Communication Jack

Communication Outlet

Communication outlet box must be 4-inch square box with faceplate.Boxes on stud walls must have raised device covers.

Faceplate must be stainless steel and must accommodate modular type communication outlet jacks and include tear-resistant icons showing computer icon for data jacks and telephone icon for voice jacks.

Communication Jack

Communication jacks must be for voice, data or radio as shown on the plans.Communication jacks must be modular 8P8C modular , for Category 5e, 4 pair UTP cable and must snap into Category 5e faceplates or termination boxes.Communication jack must be UL approved.Configurations must be as follows:

1. Voice outlets must have two 8P8C modular jacks installed in the faceplate.
2. Data outlets must have two 8P8C modular jacks installed in the faceplate.
3. Voice and data outlets must have four 8P8C modular jacks installed in the faceplate.The upper 2 communication jacks must be for voice and the lower 2 communication jacks must be for data.

99-16700C Construction

99-16700C(1) Installation

Communication Cables:

All communication cables must be installed and tested in conformance with manufacturer's recommendations.

Data and voice cables must be extended continuous and unspliced between the associated patch panels and 110 blocks and communication jack.Cables must be terminated on the 8P8C modular jacks provided in each outlet.Unless otherwise noted, each "data and voice" outlet must have 4 runs with no splices.Cable 1 and 2 must go to position 1 in the faceplate and must be white and designated as "VOICE" cables.Cable 3 and 4 must be blue and designated as "DATA" cables.

Cable Identification:All cables at terminations must be identified at all locations.All cables must be terminated in alphanumeric sequence at all terminations. 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 system must be installed at locations as shown on the plans and by methods recommended by the manufacturer.

You must provide all supports, fasteners and other hardware necessary to support the units.

99-16700C(2) Field Quality Control

Testing:

The operational test for the communication system must be performed by you in the presence of the Engineer.The operational tests must demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. All the copper communication cables must be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage.Telephone and data horizontal wiring pairs must be tested from the communication outlet to the punchdown blocks and modular patch panels.

Category 5e cables must be tested for conformance to the specifications of ANSI/TIA 568 Category 5e.

Testing must be done with TIA TSB-67 Level 2 test set.Test must include length, mutual capacitance, characteristic impedance, attenuation, and near end and far end cross talk.Any cables not meeting the requirements of the standard must be replaced by you at your expense.Complete end to end test results must be submitted to the Engineer.

You must notify the Engineer in writing not less than 15 days in advance of performing these operational tests.

REVISED STANDARD SPECIFICATIONS APPLICABLE TO THE 2010 EDITION OF THE STANDARD SPECIFICATIONS

REVISED STANDARD SPECIFICATIONS DATED 02-12-16

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*.

^^^

Replace "MSDS" in the 1st table in section 1-1.06 with:

10-17-14

MSDS[b]

Add to the 1st table in section 1-1.06:

10-30-15

LCS	Department's lane closure system
MPQP	*Material Plant Quality Program* published by the Department
POC	pedestrian overcrossing
QSD	qualified SWPPP developer
QSP	qualified SWPPP practitioner
SDS	safety data sheet
TRO	time-related overhead
WPC	water pollution control

Add to the notes of the 1st table in section 1-1.06:

10-17-14

[b]Interpret a reference to MSDS as a reference to SDS under 29 CFR 1910.1200.

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

Replace the definition of "traveled way" in section 1-1.07B with:

01-15-16

Portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.

Add to section 1-1.07B:

10-30-15

abandon: Render unserviceable in place.

adjust: Raise or lower a facility to match a new grade line.

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.

10-30-15

modify: Add to or subtract from an appurtenant part.

obliterate: Place an earth cover over or root, plow, pulverize, or scarify.

quality characteristic: Characteristic of a material that is measured to determine conformance with a given requirement.

reconstruct: Remove and disassemble and construct again at an existing or new location.

relocate: Remove and install or place in a new location.

remove: Remove and dispose of.

reset: Remove and install or place laterally at the same station location.

salvage: Remove, clean, and haul to a specified location.

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

Replace the Web site for the Department of General Services, Office of Small Business and DVBE Services in the table in section 1-1.11 with:

11-15-13

http://www.dgs.ca.gov/dgs/ProgramsServices/BusServices.aspx

Replace "--" for the telephone number for the Office Engineer in the table in section 1-1.11 with:

02-27-15

(916) 227-6299

Add to the table in section 1-1.11:

10-30-15

MPQP	http://www.dot.ca.gov/manuals.htm	--	--

^^

2 BIDDING

04-10-15

Replace the headings and paragraphs in section 2 with:

02-21-14

2-1.01 GENERAL

Section 2 includes specifications related to bid eligibility and the bidding process.

The electronic bid specifications in section 2 apply if *Electronic Bidding Contract* is shown on the cover of the *Notice to Bidders and Special Provisions*.

2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submitting a bid
2. Subcontracting for a part of the work
3. Supplying materials

2-1.03 RESERVED

02-27-15

2-1.04 CONTRACTOR REGISTRATION

No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

02-21-14

2-1.05 RESERVED

10-17-14

2-1.06 BID DOCUMENTS

01-23-15

2-1.06A General

The *Bid* book includes bid forms and certifications. For an electronic bid, the *Bid* book includes forms not available through the electronic bidding service.

The *Notice to Bidders and Special Provisions* includes the *Notice to Bidders*, revised standard specifications, and special provisions.

The *Bid* book, including *Bid* book forms not available through the electronic bidding service, *Notice to Bidders and Special Provisions*, project plans, and any addenda to these documents may be accessed at the Bidders' Exchange website.

The *Standard Specifications* and *Standard Plans* may be viewed at the Bidders' Exchange website and may be purchased at the Publication Distribution Unit.

10-17-14

2-1.06B Supplemental Project Information

The Department makes supplemental information available as specified in the special provisions.

Logs of test borings are supplemental project information.

If an *Information Handout* or cross sections are available, you may view them at the Contract Plans and Special Provisions link at the Bidders' Exchange website.

If rock cores are available, you may view them by sending a request to Coreroom@dot.ca.gov.

If other supplemental project information is available for inspection, you may view it by phoning in a request.

Make your request at least 7 days before viewing. Include in your request:

1. District-County-Route
2. Contract number
3. Viewing date
4. Contact information, including telephone number

For rock cores, also include the bridge number in your request.

If bridge as-built drawings are available:

1. For a project in District 1 through 6 or 10, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357
2. For a project in District 7, 8, 9, 11, or 12, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357, and they are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, telephone (213) 897-0877

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

2-1.06C–2-1.06D Reserved

2-1.07 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents. Notify the Department of apparent errors and patent ambiguities in the plans, specifications, and Bid Item List. Failure to do so may result in rejection of a bid or rescission of an award.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

02-21-14

2-1.08 RESERVED

2-1.09 BID ITEM LIST

Submit a bid based on the bid item quantities the Department shows on the Bid Item List.

02-27-15

2-1.10 SUBCONTRACTOR LIST

On the Subcontractor List form, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.).

For each subcontractor listed, the Subcontractor List form must show:

1. Business name and the location of its place of business.
2. California contractor license number for a non-federal-aid contract.
3. Public works contractor registration number
4. Portion of work it will perform. Show the portion of the work by:

4.1. Bid item numbers for the subcontracted work
4.2. Percentage of the subcontracted work for each bid item listed
4.3. Description of the subcontracted work if the percentage of the bid item listed is less than 100 percent

02-21-14

2-1.11 RESERVED

01-23-15

2-1.12 DISADVANTAGED BUSINESS ENTERPRISES

2-1.12A General

Section 2-1.12 applies to a federal-aid contract.

Under 49 CFR 26.13(b):

> The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
>
> (1) Withholding monthly progress payments;
> (2) Assessing sanctions;
> (3) Liquidated damages; and/or
> (4) Disqualifying the contractor from future bidding as non-responsible.

Include this assurance in each subcontract you sign with a subcontractor.

2-1.12B Disadvantaged Business Enterprise Goal

2-1.12B(1) General

Section 2-1.12B applies if a DBE goal is shown on the *Notice to Bidders*.

The Department shows a goal for DBEs to comply with the DBE program objectives provided in 49 CFR 26.1.

Make work available to DBEs and select work parts consistent with available DBEs, including subcontractors, suppliers, service providers, and truckers.

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

You are responsible to verify at bid opening the DBE firm is certified as a DBE by the California Unified Certification Program and possess the work codes applicable to the type of work the firm will perform on the Contract.

Determine that selected DBEs perform a commercially useful function for the type of work the DBE will perform on the Contract as provided in 49 CFR 26.55(c)(1)–(4). Under 49 CFR 26.55(c)(1)–(4), the DBE must be responsible for the execution of a distinct element of work and must carry out its responsibility by actually performing, managing, and supervising the work.

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

Credit for materials or supplies you purchase from DBEs will be evaluated on a contract-by-contract basis and counts toward the goal in the following manner:

1. 100 percent if the materials or supplies are obtained from a DBE manufacturer.
2. 60 percent if the materials or supplies are obtained from a DBE regular dealer.
3. Only fees, commissions, and charges for assistance in the procurement and delivery of materials or supplies, if they are obtained from a DBE that is neither a manufacturer nor regular dealer. 49 CFR 26.55 defines "manufacturer" and "regular dealer."

You receive credit toward the goal if you employ a DBE trucking company that is performing a commercially useful function. The Department uses the following factors in determining whether a DBE trucking company is performing a commercially useful function:

- The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.
- The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
- The DBE receives credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.
- The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the Contract.
- The DBE may lease trucks without drivers from a non-DBE truck leasing company. If the DBE leases trucks from a non-DBE truck leasing company and uses its own employees as drivers, it is entitled to credit for the total value of these hauling services.
- A lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

[49 Fed Reg 59595 (10/2/14) (to be codified at 49 CFR 26.55(d)]

04-10-15

2-1.12B(2) DBE Commitment Submittal

Submit DBE information under section 2-1.33.

Submit a copy of the quote from each DBE shown on the DBE Commitment form that describes the type and dollar amount of work shown on the form. Submit a DBE Confirmation form for each DBE shown on the DBE Commitment form to establish that it will be participating in the Contract in the type and dollar amount of work shown on the form. If a DBE is participating as a joint venture partner, submit a copy of the joint venture agreement.

01-23-15

2-1.12B(3) DBE Good Faith Efforts Submittal

You can meet the DBE requirements by either documenting commitments to DBEs to meet the Contract goal or by documenting adequate good faith efforts to meet the Contract goal. An adequate good faith effort means that the bidder must show that it took all necessary and reasonable steps to achieve a DBE goal that, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to meet the DBE goal.

If you have not met the DBE goal, complete and submit the DBE Good Faith Efforts Documentation form under section 2-1.33 showing that you made adequate good faith efforts to meet the goal. Only good faith efforts directed toward obtaining participation by DBEs are considered.

Submit good faith efforts documentation within the specified time to protect your eligibility for award of the contract in the event the Department finds that the DBE goal has not been met.

Refer to 49 CFR 26 app A for guidance regarding evaluation of good faith efforts to meet the DBE goal.

The Department considers DBE commitments of other bidders in determining whether the low bidder made good faith efforts to meet the DBE goal.

02-21-14

2-1.13–2-1.14 RESERVED

2-1.15 DISABLED VETERAN BUSINESS ENTERPRISES

2-1.15A General

Section 2-1.15 applies to a non-federal-aid contract.

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

Comply with Mil & Vet Code § 999 et seq.

2-1.15B Projects $5 Million or Less

Section 2-1.15B applies to a project with an estimated cost of $5 million or less.

Make work available to DVBEs and select work parts consistent with available DVBE subcontractors and suppliers.

Meet the goal shown on the *Notice to Bidders*.

Complete and submit the Certified DVBE Summary form under section 2-1.33. List all DVBE participation on this form.

If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Summary form.

List each 1st-tier DVBE subcontractor on the Subcontractor List form regardless of percentage of the total bid.

2-1.15C Projects More Than $5 Million

2-1.15C(1) General

Section 2-1.15C applies to a project with an estimated cost of more than $5 million.

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

If you obtain DVBE participation:

1. Complete and submit the Certified DVBE Summary form under section 2-1.33. List all DVBE participation on this form.
2. List each 1st tier DVBE subcontractor in the Subcontractor List form regardless of percentage of the total bid.

If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Summary form.

2-1.15C(2) DVBE Incentive

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

To receive this incentive, submit the Certified DVBE Summary form under section 2-1.33.

Bidders other than the apparent low bidder, the 2nd low bidder, and the 3rd low bidder may be required to submit the Certified DVBE Summary form if the bid ranking changes. If the Department requests a Certified DVBE Summary form from you, submit the completed form within 4 business days of the request.

2-1.15C(3) Incentive Evaluation

The Department applies the small business and non–small business preference during bid verification and proceeds with the evaluation specified below for DVBE incentive.

The DVBE incentive is a reduction, for bid comparison only, in the total bid submitted by the lesser of the following amounts:

1. Percentage of DVBE achievement rounded to 2 decimal places of the verified total bid of the low bidder
2. 5 percent of the verified total bid of the low bidder
3. $250,000

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

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

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

2-1.16–2-1.17 RESERVED

2-1.18 SMALL BUSINESS AND NON–SMALL BUSINESS SUBCONTRACTOR PREFERENCES

2-1.18A General

Section 2-1.18 applies to a non-federal-aid contract.

The Department applies small business preferences and non–small business preferences under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.

Any contractor, subcontractor, supplier, or service provider who qualifies as a small business is encouraged to apply for certification as a small business by submitting its application to the Department of General Services, Office of Small Business and DVBE Services.

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

2-1.18B Small Business Preference

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

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

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

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

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

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

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

2-1.18C Non–Small Business Subcontractor Preference

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

1. Bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid
2. Certified Small Business Listing for the Non–Small Business Preference form shows that you are subcontracting at least 25 percent to certified small businesses

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

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

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

2-1.19–2-1.26 RESERVED

2-1.27 CALIFORNIA COMPANIES

Section 2-1.27 applies to a non-federal-aid contract.

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

Complete a California Company Preference form.

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

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

2-1.28 RESERVED

2-1.29 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

You may opt out of the payment adjustments for price index fluctuations specified in section 9-1.07. To opt out, submit a completed Opt Out of Payment Adjustments for Price Index Fluctuations form under section 2-1.33.

2-1.30–2-1.32 RESERVED

02-27-15

2-1.33 BID DOCUMENT COMPLETION AND SUBMITTAL

2-1.33A General

Complete the forms in the *Bid* book.

Use the forms provided by the Department except as otherwise specified for a bidder's bond.

Do not fax forms except for the copies of forms with the public works contractor registration number submitted after the time of bid. Fax these copies to (916) 227-6282.

Submit the forms and copies of the forms to the Office Engineer.

Failure to submit the forms and information as specified may result in a nonresponsive bid.

If an agent other than the authorized corporate officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.33B Electronic Bids

Section 2-1.33B applies to electronic bids.

For an electronic bid, complete and submit the electronic portion of the *Bid* book under the *Electronic Bidding Guide* at the Bidders' Exchange website and submit the paper forms as specified for a paper bid.

Your authorized digital signature is your confirmation of and agreement to all certifications and statements contained in the *Bid* book.

On forms and certifications that you submit through the electronic bidding service, you agree that each form and certification where a signature is required is deemed as having your signature.

2-1.33C Paper Bids

Section 2-1.33C applies to paper bids.

Submit your bid and any *Bid* book forms after you submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

2-1.33D Bid Form Submittal Schedules

2-1.33D(1) General

The *Bid* book includes forms specific to the contract. The deadlines for the submittal of the forms vary depending on the requirements of each contract. Determine the requirements of the contract and submit the forms based on the applicable schedule specified in section 2-1.33D.

Bid forms and information on the form that are due after the time of bid may be submitted at the time of bid.

2-1.33D(2) Federal-Aid Contracts

2-1.33D(2)(a) General

Section 2-1.33D(2) applies to a federal-aid contract.

04-10-15

2-1.33D(2)(b) Contracts with a DBE Goal

Section 2-1.33D(2)(b) applies if a DBE goal is shown on the *Notice to Bidders*.

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Federal-Aid Contract with a DBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Small Business Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid
DBE Commitment	No later than 4 p.m. on the 4th business day after bid opening
DBE Confirmation	No later than 4 p.m. on the 4th business day after bid opening
DBE Good Faith Efforts Documentation	No later than 4 p.m. on the 4th business day after bid opening

[a]Submit only if you choose the option.

02-27-15

2-1.33D(2)(c) Contracts without a DBE Goal

Reserved

2-1.33D(2)(d)–2-1.33D(2)(h) Reserved

2-1.33D(3) Non-Federal-Aid Contracts

2-1.33D(3)(a) General

Section 2-1.33D(3) applies to non-federal-aid contracts.

2-1.33D(3)(b) Contracts with a DVBE Goal

Section 2-1.33D(3)(b) applies if a DVBE goal is shown on the *Notice to Bidders*.

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Non-Federal-Aid Contract with a DVBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid
Certified DVBE Summary	No later than 4 p.m. on the 4th business day after bid opening
California Company Preference	Time of bid
Request for Small Business Preference or Non–Small Business Preference[a]	Time of bid
Certified Small Business Listing for the Non–Small Business Preference[a]	No later than 4 p.m. on the 2nd business day after bid opening

[a]Submit only if you choose the option or preference.

2-1.33D(3)(c) Contracts without a DVBE Goal

Reserved

2-1.33D(3)(d)–2-1.33D(3)(h) Reserved

2-1.33D(4)–2-1.33D(9) Reserved

02-21-14

2-1.34 BIDDER'S SECURITY

Submit one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Signed bidder's bond by an admitted surety insurer
5. For an electronic bid, electronic bidder's bond by an admitted surety insurer submitted using an electronic registry service approved by the Department.

Submit cash, cashier’s check, certified check, or bidder's bond to the Department at the Bidders Exchange before the bid opening time.

Submit electronic bidder’s bond with the electronic bid.

If using a bidder's bond, you may use the form in the *Bid* book. If you do not use the form in the *Bid* book, use a form containing the same information.

2-1.35–2-1.39 RESERVED

2-1.40 BID WITHDRAWAL

For a paper bid:

1. An authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.
2. After the bid opening time, you cannot withdraw a bid.

For an electronic bid:

1. Bids are not filed with the Department until the date and time of bid opening.
2. A bidder may withdraw or revise a bid after it has been submitted to the electronic bidding service if this is done before the bid opening date and time.

2-1.41–2-1.42 RESERVED

2-1.43 BID OPENING

The Department publicly opens and reads bids at the time and place shown on the *Notice to Bidders*.

2-1.44–2-1.45 RESERVED

2-1.46 DEPARTMENT'S DECISION ON BID

The Department's decision on the bid amount is final.

The Department may reject:

1. All bids
2. A nonresponsive bid

2-1.47 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to the Office Engineer. The Relief of Bid Request form is available at the Department's website.

2-1.48 RESERVED

2-1.49 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

2-1.50 BID RIGGING

Section 2-1.50 applies to a federal-aid contract.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available 24 hours 7 days a week and is confidential and anonymous.. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

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3 CONTRACT AWARD AND EXECUTION

02-27-15

Replace section 3-1.02 with:

02-21-14

3-1.02 CONSIDERATION OF BIDS

3-1.02A General

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time.

3-1.02B Tied Bids

The Department breaks a tied bid with a coin toss except:

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

Replace section 3-1.03 with:

02-27-15

3-1.03 CONTRACTOR REGISTRATION

No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

Add to the end of section 3-1.04:

10-19-12

You may request to extend the award period by faxing a request to (916) 227-6282 before 4:00 p.m. on the last day of the award period. If you do not make this request, after the specified award period:

1. Your bid becomes invalid
2. You are not eligible for the award of the contract

Replace the paragraph in section 3-1.11 with:

10-19-12

Complete and deliver to the Office Engineer a *Payee Data Record* when requested by the Department.

Replace section 3-1.12 with:

01-23-15

3-1.12 RESERVED

Replace section 3-1.13 with:

07-27-12

3-1.13 FORM FHWA-1273

For a federal-aid contract, form FHWA-1273 is included with the Contract form in the documents sent to the successful bidder for execution. Comply with its provisions. Interpret the training and promotion section as specified in section 7-1.11A.

01-23-15

Delete items 4 and 6 of the 2nd paragraph of section 3-1.18.

02-27-15

Delete the 3rd paragraph of section 3-1.18.

Replace "For all other contracts, the" in the 4th paragraph of section 3-1.18 with:

02-27-15

The

^^

4 SCOPE OF WORK

10-30-15

Replace the 2nd paragraph of section 4-1.13 with:

10-30-15

The Department does not require you to remove warning, regulatory, or guide signs before Contract acceptance.

^^

5 CONTROL OF WORK

10-30-15

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 8th paragraph of section 5-1.13A with:

04-24-15

Each subcontractor must have an active and valid:

1. State contractor license with a classification appropriate for the work to be performed (Bus & Prof Code § 7000 et seq.)
2. Public works contractor registration number with the Department of Industrial Relations

Replace section 5-1.13B with:

01-23-15

5-1.13B Disadvantaged Business Enterprises

5-1.13B(1) General

Section 5-1.13B applies to a federal-aid contract.

Use each DBE as listed on the DBE Commitment form unless you receive authorization for a substitution. Ensure that all subcontracts and agreements with DBEs to supply labor or materials are performed under 49 CFR 26.

Maintain records, including:

1. Name and business address of each 1st-tier subcontractor
2. Name and business address of each DBE subcontractor, DBE vendor, and DBE trucking company, regardless of tier
3. Date of payment and total amount paid to each business

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

Before the 15th day of each month for the previous month's work, submit:

1. Monthly DBE Trucking Verification form
2. Monthly DBE Payment form

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

Upon work completion, complete a Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors form. Submit it within 30 days of Contract acceptance. The Department withholds $10,000 until the form is submitted. The Department releases the withhold upon submission of the completed form.

04-10-15

5-1.13B(2) Performance of Disadvantaged Business Enterprises

Section 5-1.13(B)(2) applies if a DBE goal is shown on the *Notice to Bidders*.

DBEs must perform work or supply materials as listed on the DBE Commitment form.

Do not terminate or substitute a listed DBE for convenience and perform the work with your own forces or those of an affiliate, a non-DBE firm, or another DBE firm or obtain materials from other sources without authorization from the Department.

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

1. Listed DBE fails or refuses to execute a written contract based on the plans and specifications for the project.

2. You stipulated that a bond is a condition of executing the subcontract and the listed DBE fails to meet your bond requirements.
3. Work requires a contractor license and the listed DBE does not have a valid license under the Contractors License Law.
4. Listed DBE fails or refuses to perform the work or furnish the listed materials.
5. Listed DBE's work is unsatisfactory and not in compliance with the Contract.
6. Listed DBE is ineligible to work on the project because of suspension or debarment.
7. Listed DBE becomes bankrupt or insolvent.
8. Listed DBE voluntarily withdraws with written notice from the Contract.
9. Listed DBE is ineligible to receive credit for the type of work required.
10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.
11. Department determines other documented good cause under 49 CFR 26.53.

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

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

If the Department authorizes the termination or substitution of a listed DBE, make good faith efforts to find another DBE. The substitute DBE must (1) perform at least the same dollar amount of work as the original DBE under the Contract to the extent needed to meet the DBE goal and (2) be certified as a DBE with the work code applicable to the type of work the DBE will perform on the Contract at the time of your request for substitution. Submit your documentation of good faith efforts within 7 days of your request for authorization of the substitution. The Department may authorize a 7-day extension of this submittal period at your request. Refer to 49 CFR 26 app A for guidance regarding evaluation of good faith efforts to meet the DBE goal.

Unless the Department authorizes a request to terminate or substitute a listed DBE, the Department does not pay for work unless it is performed or supplied by the DBE listed on the DBE Commitment form. You may be subject to other sanctions under 49 CFR 26.

Replace the paragraphs of section 5-1.13C with:

11-15-13

Section 5-1.13C applies to a non-federal-aid contract.

Use each DVBE as shown on the *Certified DVBE Summary* form unless you receive authorization from the Department for a substitution. The substitute must be another DVBE unless DVBEs are not available, in which case, you must substitute with a small business. Any authorization for a substitute is contingent upon the Department of General Services' approval of the substitute.

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

The Department authorizes substitutions for any of the reasons provided in 2 CA Code of Regs § 1896.73.

Include in your substitution request:

1. Copy of the written notice issued to the DVBE with proof of delivery
2. Copy of the DVBE's response to the notice
3. Name and certification number of the listed DVBE and the proposed substitute

Requests for substitutions of a listed DVBE with a small business must include documentation of the unavailability of DVBEs, including:

1. Contact with the small business/DVBE advocate from the Department and the Department of Veterans Affairs
2. Search results from the Department of General Services' website of available DVBEs
3. Communication with a DVBE community organization nearest the job site, if applicable
4. Documented communication with the DVBE and small businesses describing the work to be performed, the percentage of the total bid, the corresponding dollar amount, and the responses to the communication

The Department forwards your substitution request to the Department of General Services. The Department of General Services issues a notice of approval or denial. The Department provides you this notice.

If you fail to use a listed DVBE without an authorized substitution request, the Department issues a penalty of up to 10 percent of the dollar amount of the work of the listed DVBE.

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

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

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

1. Upon work completion, complete and submit *Final Report - Utilization of Disabled Veteran Business Enterprises (DVBE) State Funded Projects Only* form.
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purposes of:
   2.1. Interviewing employees.
   2.2. Inspecting and copying books, records, accounts and other material that may be relevant to a matter under investigation.

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.

Replace section 5-1.20E with:

05-30-14

5-1.20E Water Meter Charges

Section 5-1.20E applies if a bid item for water meter charges is shown on the Bid Item List. The charges are specified in a special provision for section 5-1.20E.

The local water authority will install the water meters.

The charges by the local water authority include:

1. Furnishing and installing each water meter
2. Connecting to the local water authority's main water line, including any required hot tap or tee
3. Furnishing and installing an extension pipe from the main water line to the water meter
4. Sterilizing the extension pipe

Make arrangements and pay the charges for the installation of the water meters.

If a charge is changed at the time of installation, the Department adjusts the lump sum price based on the difference between the specified charges and the changed charges.

Replace section 5-1.20F with:

05-30-14

5-1.20F Irrigation Water Service Charges

Reserved

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

Replace "settled" in the last paragraph of section 5-1.43E(1)(d) with:

04-10-15

resolved

Replace items 3.1 and 3.2 in the list in the paragraph of section 5-1.43E(3)(b) with:

04-24-15

3.1. One-time objection to the other's candidate without stating a reason
3.2. Objection to any of the other's subsequent candidates based on a specific breach of the candidate's responsibilities or qualifications under items 1 and 2 above

Add between "held" and "no later than" in the 2nd sentence of the 1st paragraph of section 5-1.43E(3)(e):

10-30-15

no sooner than 30 days and

^^

6 CONTROL OF MATERIALS

10-30-15

Add between "replacing" and "Department-furnished" in the 1st sentence in the last paragraph of section 6-2.03:

10-30-15

lost or damaged

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

10-24-15

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.

04-19-13

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 the 2nd paragraph of section 6-3.04 with:

10-30-15

Develop, implement, and maintain a QC program.

Prepare and maintain QC records, including:

1. Names and qualifications of:
   1.1. Samplers
   1.2. Testers
   1.3. Inspectors
2. Testing laboratories' identification and certifications
3. Testing equipment calibrations and certifications
4. Inspection reports
5. Sampling and testing records organized by date and type of material
6. Test results with comparison of quality characteristic requirements
7. Test results in relation to action and any suspension limits
8. Records of corrective actions and suspensions

Within 24 hours, notify the Engineer of any noncompliance identified by your QC program.

Allow the Department access to all QC records.

Submit QC test data and QC test results within 2 business days of test completion.

Add between the 1st and 2nd paragraphs of section 6-3.05A:

10-30-15

The Department may inspect, sample, and test materials for compliance with the Contract at any time.

The Department's independent assurance program is described in the Department's *Independent Assurance Manual: Procedures for Accreditation of Laboratories and Qualification of Testers*. For the manual, go to the METS website.

10-30-15

Delete "if they are available at the job site" from the 3rd paragraph of section 6-3.05A.

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

02-12-16

Replace "§§ 1727 and 1770–1815" in the 1st sentence of the 1st paragraph of section 7-1.02K(1) with:

02-27-15

§ 1720 et seq.

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

05-30-14

Add between the 1st and 2nd sentences in the 2nd paragraph of section 7-1.02K(6)(b):

10-30-15

Shop drawings of protective systems for which the Construction Safety Orders require design by a registered professional engineer must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Delete "water or" in the 9th paragraph of section 7-1.03.

Add to the end of the 10th paragraph of section 7-1.03:

10-30-15

Flagging must comply with section 12-1. The Department pays you for this work under section 12-1.04.

Add between the 1st and 2nd sentences of the 7th paragraph of section 7-1.04:

10-30-15

Flagging must comply with section 12-1. The Department pays you for this work under section 12-1.04.

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.

10-30-15

Delete "lane" in the 2nd sentence in the 27th paragraph of section 7-1.04.

Add between the 1st and 2nd paragraphs of section 7-1.11A:

02-12-16

Comply with 46 CFR 381.7(a)–(b).

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

10-30-15

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:

10-30-15

The Department does not adjust time for work performed before Contract approval.

Replace the 1st paragraph of section 8-1.05 with:

10-30-15

Contract time starts on the earlier of the following:

1. Day you start job site activities after Contract approval
2. Last day specified to start job site activities in section 8-1.04

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:

10-30-15

The Department does not make a payment adjustment for overhead incurred during non–working days of additional construction seasons experienced by reason of delay.

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

10-30-15

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 "10" in the last paragraph of section 9-1.03 with:

01-23-15

7

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

Replace the heading and the 1st paragraph of section 9-1.04D(3) with:

01-23-15

9-1.04D(3) Equipment Not On the Job Site and Not Required for Original Contract Work

For equipment not on the job site at the time required to perform work paid by force account and not required for original Contract work, the time paid is the time the equipment is operated to perform work paid by force account and the time to return the equipment to its source when the work paid by force account is completed.

Replace item 2 in the 3rd paragraph of section 9-1.04D(3) with:

01-23-15

2. Operated less than 4 hours is paid as 1/2 day

Replace section 9-1.04D(4) with:

01-23-15

9-1.04D(4) Equipment Not On the Job Site and Required for Original Contract Work

For equipment not on the job site at the time required to perform work paid by force account and required for original Contract work, the time paid is the time:

1. To move the equipment to the location of work paid by force account plus an equal amount of time to move the equipment to a location on the job site or its source when the work paid by force account is completed
2. Equipment is operated to perform work paid by force account

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

$Qh = HMATT \times Xa$

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

$Qrh = RHMATT \times 0.80 \times Xarb$

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

$Qmh = MHMATT \times [(100 - Xam) / 100] \times Xmab$

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

$Qrap = HMATT \times Xaa$

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.

11-15-13

9-1.16D(2) Mobilization for Projects Except for Those Over Water Requiring Marine Access

07-19-13

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.

Add to the end of the 2nd paragraph of section 9-1.16E(1):

10-30-15

except as specified in section 9-1.16E(3)

10-19-12

Delete "revised Contract" in item 1 of the 1st paragraph of section 9-1.16E(2).

Add to the end of the 1st sentence of the 1st paragraph of section 9-1.16E(3):

10-30-15

except as specified below for the failure to submit a document during the last estimate period

Add to the end of section 9-1.16E(3):

10-30-15

During the last estimate period, if you fail to submit a document as specified, the Department withholds $10,000 for each document. The Department returns the withhold within 30 days after receipt of the document.

Replace the 1st paragraph of section 9-1.16E(4) with:

10-30-15

The Department withholds payments to cover claims filed under Civ Code § 9000 et seq.

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.

^^^

1. Applying a dust palliative under section 18
2. Applying temporary soil stabilization under section 13-5
3. Managing material stockpiles under section 13-4.03C(3)

04-19-13

10-6 JOB SITE WATER CONTROL

10-6.01 GENERAL

Section 10-6 includes specifications for controlling water to provide a dry working area at the job site.

10-6.02 WATER-FILLED COFFERDAM

Reserved

10-6.03–10-6.10 RESERVED

10-7–10-20 RESERVED

^^

11 QUALITY CONTROL AND ASSURANCE

10-30-15

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.

Replace the 2nd and 3rd paragraphs in section 11-3.03B with:

10-30-15

The AISC Certification category for overhead sign structures is Bridge and Highway Metal Component (CPT) or Simple Steel Bridge Structures (SBR).

The AISC Certification category for pole structures is Bridge and Highway Metal Component (CPT) or Standard for Steel Building Structures (STD).

^^

12 TEMPORARY TRAFFIC CONTROL

01-15-16

Replace the 5th paragraph of section 12-3.01A(1) with:

05-30-14

Repair or replace traffic-handling equipment and devices damaged from any cause during the Contract, including repainting if necessary. The condition of temporary traffic control devices must comply with the current American Traffic Safety Services Association publication "Quality Guidelines for Temporary Traffic Control Devices and Features."

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 the 2nd and 3rd paragraphs of section 12-3.04B with:

10-30-15

Portable delineators must be a minimum of 36 inches in height. The vertical portion of portable delineators must be predominantly orange-colored. The posts must be not less than 3 inches in width or diameter. Retroreflectorization of portable delineators that have a height of less than 42 inches must be provided by two 3-inch-wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of portable delineators that have a height of 42 inches or more must be provided by four 4- to 6-inch-wide alternating orange and white stripes with the top stripe being orange.

Add between the 1st and 2nd paragraphs of section 12-3.06A(1):

10-30-15

Construction project funding signs must comply with section 12-2.

Replace "project" in the 3rd paragraph of section 12-3.07C with:

10-19-12

work

Replace the 1st sentence of the 5th paragraph of section 12-3.08C with:

10-30-15

Install a reflector on the top or face of the rail of each rail unit placed within 10 feet of a traffic lane.

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.

10-30-15

If the Engineer orders you to remove a closure before the time designated in the authorized closure schedule, any delay caused by this order is an excusable delay.

07-19-13

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.

01-15-16

12-4.03D Closure Status

Update the status of authorized closures using the LCS Mobile web page.

For a stationary closure, use code:

1. 10-97 immediately before you place the 1st advance warning sign
2. 10-98 immediately after you remove all of the advance warning signs

For a moving closure, use code:

1. 10-97 immediately before the actual start time of the closure
2. 10-98 immediately after the actual end time of the closure

Cancel an authorized closure by using code 10-22 within 2 hours after the authorized start time.

If you are unable to access the LCS Mobile web page, immediately notify the Engineer of the closure's status.

Add to the end of section 12-6.01:

10-30-15

A traffic control system for a closure includes the temporary traffic control devices described as part of the traffic control system. The temporary traffic control devices must comply with section 12-3.

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

05-15-15

04-19-13

Delete item 3 in the list in the 4th paragraph of section 13-1.01A.

Add to section 13-1.01A:

11-15-13

Comply with the Department's general permit issued by the State Water Resources Control Board for *Order No. 2012-0011-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 the 3rd paragraph of section 13-3.01B(2)(c) with:

05-15-15

The SAP must identify the sample containers, preservation requirements, holding times, analytical method, and the laboratory certified under the Environmental Laboratory Accreditation Program of the State Water Resources Control Board. For a list of certified laboratories, go to the board's website.

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

05-30-14

Delete the 7th paragraph of section 13-4.03C(3).

Replace the heading of section 13-4.03E(1) with:

05-30-14

General

05-30-14

Delete the 1st through 5th sentences in the 2nd paragraph of section 13-4.03E(1).

Replace the 1st sentence of the 1st paragraph of section 13-4.03E(3) with:

05-30-14

Limit vehicle and equipment cleaning or washing at the job site to that needed for safety and protection of the equipment and compliance with PLACs.

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

^^

14 ENVIRONMENTAL STEWARDSHIP

05-15-15

Replace section 14-9.03 with:

05-30-14

14-9.03 RESERVED

Replace "California Department of Public Health (CDPH)" in the 2nd paragraph of section 14-11.02E(1) with:

05-15-15

State Water Resources Control Board

^^

15 EXISTING FACILITIES

01-15-16

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

10-30-15

Delete "using Department-furnished tags" in the 4th paragraph of section 15-2.03A(2)(a).

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.

Replace the paragraphs of section 15-3.04 with:

10-30-15

Not Used

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 2nd sentence of the 3rd paragraph of section 15-4.02C(1) with:

10-17-14

Paint exposed ends of the remaining reinforcement with 2 applications of organic zinc-rich primer as specified for painting exposed ends of prestressing steel in section 50-1.03B(3).

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 items 5 and 6 in the list in the 1st paragraph of section 15-6.01D with:

01-15-16

5. Performing postrehabilitation inspection

Add after the 4th paragraph of section 15-6.01D:

01-15-16

Record the quantity of grout that is installed and submit this quantity. The Department does not pay for (1) grout that leaks through to the inside of the culvert or (2) grout material that is wasted, disposed of, or remaining on hand after the completion of the work.

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

^^^

^^

18 DUST PALLIATIVE

10-30-15

Replace section 18 with:

10-30-15

18 DUST PALLIATIVES

18-1.01 GENERAL

18-1.01A Summary

Section 18 includes specifications for applying dust palliatives.

A dust palliative must be any of the following:

1. Water
2. Dust suppressant
3. Dust control binder

Water must comply with section 17.

18-1.01B Definitions

Reserved

18-1.01C Submittals

If a dust suppressant or dust control binder is to be used, submit a dust treatment plan at least 15 days before starting job site activities. The dust treatment plan must include:

1. Product name and type
2. Manufacturer's name
3. Polymer emulsion type if a synthetic polymer emulsion is used, including identification of:
   - 3.1. Individual components greater than 5 percent by volume in blends of polymers with different compositions
   - 3.2. Additives greater than 2 percent by volume
4. SDS
5. Proposed methods for applying products
6. Application rate per pass, total application rate, and residual application rate
7. Required weather conditions for application, including ambient and surface temperatures, wind conditions, and allowable period before expected precipitation
8. Drying time or curing time required before traffic is allowed on the treated surface

Submit the manufacturer's instructions for the material to be used.

Submit a certificate of compliance for the dust suppressant, dust control binders, and fibers.

For a dust suppressant, include with the certificate of compliance:

1. Test results verifying compliance with the quality characteristic requirements in section 18-1.01D. The results must be from a test conducted within 12 months before the date of the certificate of compliance.
2. Test results from a test conducted within 12 months before the date of the certificate of compliance verifying compliance with the following environmental requirements:
   - 2.1. Maximum constituent concentration levels
   - 2.2. Organic and inorganic requirements for:
     - 2.2.1. VOCs
     - 2.2.2. Semi-VOCs
     - 2.2.3. Synthetic precipitation leaching procedure
   - 2.3. Aquatic toxicity

18-1.01D Quality Control and Assurance

A dust suppressant or dust control binder must comply with US EPA requirements and RWQCB requirements for soil stabilizers.

A dust suppressant must be tested by either an ASTM- or AMRL-AASHTO-accredited laboratory for compliance with the specified quality characteristic requirements.

A dust suppressant must be tested by an EPA-accredited laboratory for environmental requirements. Liquid chemical treatments must be tested before dilution. Solid products must be mixed with water to a 25 percent concentration before testing. The constituent concentration for each dust suppressant must not exceed the maximum levels shown in the following table:

Maximum Constituent Concentration Levels

Constituent	Test method	Requirement maximum level (ppm)
Arsenic	EPA Method 200.7	5.0
Barium		100.0
Cadmium		0.2
Chromium		1.0
Copper		1.0
Lead		1.0
Mercury	EPA Method 245.1	0.05
Selenium	EPA Method 200.7	5.0
Zinc		10.0
Phosphorus	EPA Method 365.4	2500.0
Cyanide	EPA Method 335.4	0.2

A dust suppressant must comply with the requirements shown in the following table:

Organic and Inorganic Requirements

Quality characteristic	Test method	Requirement
VOCs	EPA Method 8260	Set by the CalEPA Air Resources Board and local air district
Semi-VOCs	EPA Method 8270	US EPA Target Compound List and Contract-required quantitation limits
Synthetic precipitation leaching procedure	EPA Method 1312	Set by the RWQCB

A dust suppressant must comply with the aquatic toxicity requirements shown in the following table:

Aquatic Toxicity Requirements

Quality characteristic	Test method	Requirement
Aquatic toxicity[a] (LC50 min, ppm)	ASTM E729 or EPA Method 600/4-90/027F and EPA Method 600/4-91/002	10
Aquatic toxicity[a] (rating)	ASTM E729 or EPA Method 600/4-90/027F and EPA Method 600/4-91/002	slightly toxic or better
Renewal toxicity[b] (LC50 min, ppm)	ASTM E1295	10
Renewal toxicity[b] (rating)	ASTM E1295	slightly toxic or better

[a]Using *Ceriodaphnia dubia* (water flea), *Oncorhynchus mykiss* (rainbow trout), *Pimephales promelas* (fathead minnow), and *Americamysis bahia* (mysid shrimp)
[b]Using *Ceriodaphnia dubia* (water flea)

18-1.02 MATERIALS

18-1.02A General

A dust suppressant or a control binder must be either (1) miscible in water or (2) a material that is directly applied to the surface without mixing with water.

18-1.02B Dust Suppressants

18-1.02B(1) General

A dust suppressant must be one of the following:

1. Petroleum-based organic product
2. Nonpetroleum-based organic product
3. Hygroscopic product
4. Synthetic polymer emulsion

18-1.02B(2) Petroleum-Based Organic Products

A petroleum-based organic dust suppressant must be an asphalt emulsion, petroleum resin, base oil, mineral oil, or synthetic fluid.

An asphalt emulsion must be Grade SS1h.

A petroleum resin must comply with the requirements shown in the following table:

Petroleum Resin Requirements

Quality characteristic	Test method	Requirement
Residue (min, %)	ASTM D6934	60
pH	ASTM D1429	4.0–7.0
sp gr at 16 °C (min)	ASTM D1298	1.00
Kinematic visc at 25 °C (min, Saybolt Furol seconds[a])	ASTM D2170	188
Flash point (min °C)	ASTM D92	205
Particle charge test	ASTM D7402	Positive

[a]Use ASTM D2161 to convert the mm^2/s value to Saybolt Furol seconds

A base or mineral oil must comply with the requirements shown in the following table:

Base and Mineral Oils Requirements

Quality characteristic	Test method	Requirement
Base and mineral oil content (min, %)	--	75
sp gr at 16 °C (min)	ASTM D1298	0.85–0.90
Brookfield absolute visc at 20 °C (max, cP)	ASTM D2196	250
Flash point (min, °C)	ASTM D93	150

A synthetic fluid must comply with 40 CFR 35 and the requirements shown in the following table:

Synthetic Fluids Requirements

Quality characteristic	Test method	Requirement
Synthetic fluid content (min, %)	--	75
sp gr at 16 °C (min)	ASTM D1298	0.85–0.90
Brookfield absolute visc at 20 °C (max, cP)	ASTM D2196	250
Flash point (min, °C)	ASTM D93	140

18-1.02B(3) Nonpetroleum-Based Organic Products

A nonpetroleum-based organic dust suppressant must be lignosulfonate, plant oil, or tall oil pitch rosin.

A lignosulfonate must comply with the requirements shown in the following table:

Lignosulfonate Requirements

Quality characteristic	Test method	Requirement
Lignin sulfonate content ready to use (min, %)	ASTM D4900	25
Residue total solids content (min %)	ASTM D4903 or D2834	52
Lignin sulfonate content of residue (min, %)	--	50
Reducing sugars content of residue (min, %)	ASTM D5896 or D6406	25
pH	ASTM D1293	6.0–9.0
sp gr (min)	ASTM D1429	1.20
Brookfield absolute visc at 25 °C (max, cP)	ASTM D2196	1,000

A plant oil must comply with the requirements shown in the following table:

Plant Oil Requirements

Quality characteristic	Test method	Requirement
Residue active solids content (min, %)	ASTM D4903	50
sp gr (min)	ASTM D1429	0.93
Brookfield absolute visc 25 °C (cP)	ASTM D2196	50–200
Flash point (min, °C)	ASTM D93	288

A tall oil pitch rosin must comply with the requirements shown in the following table:

Tall Oil Pitch Rosin Requirements

Quality characteristic	Test method	Requirement
Rosin acid content (min, %)	ASTM D1240	10
Residue active solids content (min, %)	ASTM D2834	45
pH	ASTM D1293	3.0–9.0
sp gr (min)	ASTM D1429	1.00
Brookfield absolute visc at 25 °C (cP)	ASTM D2196	50–200

18-1.02B(4) Hygroscopic Products

A hygroscopic dust suppressant must be calcium chloride, calcium chloride flake, or magnesium chloride.

Calcium chloride must comply with the requirements shown in the following table:

Calcium Chloride[a] Requirements

Quality characteristic	Test method	Requirement
Calcium chloride content (%)	ASTM E449	28–42
Total magnesium chloride (max, %)	ASTM E449	6.0
Total alkali chlorides as sodium chloride (max, %)	ASTM E449	6.0
Calcium hydroxide content (max, %)	ASTM E449	0.2
pH with 5 percent solution	ASTM D1293	7.0–9.0
sp gr	ASTM D1429	1.28–1.44

[a]ASTM D98 or AASHTO M144

Calcium chloride flake must comply with the requirements shown in the following table:

Calcium Chloride Flake[a] Requirements

Quality characteristic	Test method	Requirement
Calcium chloride content (min, %)	ASTM E449	75
Total magnesium as $MgCl_2$ (max, %)	ASTM E449	6.0
Total alkali chlorides as sodium chloride (max, %)	ASTM E449	6.0
Calcium hydroxide content (max, %)	ASTM E449	0.2
pH with 5 percent solution	ASTM D1293	7.0–9.0
Gradation percent passing 3/8–inch sieve No. 4 sieve No. 30 sieve	ASTM C136	 100 80–100 0–5

[a]ASTM D98 or AASHTO M144

Magnesium chloride must comply with the requirements shown in the following table:

Magnesium Chloride Requirements

Quality characteristic	Test method	Requirement
Magnesium chloride content (%)	ASTM D4691 or ASTM D511[a]	28–33
Sulfate content as magnesium sulfate (max, %)	ASTM D4691[a]	4.0
Potassium content as potassium chloride (max, %)	ASTM E449	0.5
Sodium chloride content (max, %)	ASTM E449	1.0
pH with 5% solution	ASTM D1293	7.0–9.0
sp gr	ASTM D1429	1.31 ± 0.02

[a]You may use another appropriate atomic absorption spectrophotometry method such as that in *Standard Methods for the Examination of Water and Waste Water* by APHA-AWWA-WPCF.

18-1.02B(5) Synthetic Polymer Emulsions

A synthetic polymer emulsion must comply with the requirements shown in the following table:

Synthetic Polymer Emulsion Requirements

Quality characteristic	Test method	Requirement
Residue active solids content (min, %)	ASTM D2834	40
pH	ASTM D1429	4.0–9.5
sp gr at 16 °C	ASTM D1298	1.00–1.15
Brookfield absolute visc (max, cP)	ASTM D2196	1,000
Polymer film tensile strength – dry (psi)	ASTM D412	500
Retained coagulum on no. 100 sieve (max, %)	ASTM D1417	0.1
Ash content (max, %)	ASTM D5040	2

18-1.02C Dust Control Binders

A dust control binder must comply with the specifications for a tackifier in section 21-1.02F except section 21-1.01 does not apply.

Fibers must comply with section 21-1.02E except section 21-1.01 does not apply.

18-1.03 CONSTRUCTION

18-1.03A General

Monitor dust conditions and apply a dust palliative for dust control as described and as ordered. Reapply the dust palliative at any time to control dust.

Apply a dust suppressant to:

1. Temporary haul roads
2. Construction staging, material storage, and layout areas
3. Compacted soil or AB roads or driveways
4. Paved surfaces

Apply a dust control binder to:

1. Rough–graded soils
2. Completed slopes
3. Soil stockpiles unless another practice is already used

Do not use a dust suppressant or dust control binder within 100 feet of a wetland or body of water.

18-1.03B Equipment

Apply dust suppressants that are miscible in water with either (1) a pressure-type water distributor truck equipped with a spray system or (2) a pressure-type asphalt distributor truck as specified in section 93-1.03C.

Apply dust suppressant flakes to the surface using a spreader or spinner disk.

Apply dust control binders with either (1) a pressure-type water distributor truck equipped with a spray system or (2) hydraulic spray equipment as specified for applying hydromulch in section 21-1.03E.

18-1.03C Mixing and Application Rates

Use the mix proportions and application rate for the corresponding dust suppressant as shown in the following table:

Dust Suppressant Application

Dust suppressant	Mix proportions	Application rate
Asphaltic emulsion, Grade SS1H	5 parts water to 1 part emulsion	0.20–1.0 gal/sq yd
Petroleum resin emulsion	5 parts water to 1 part emulsion	0.20–1.0 gal/sq yd
Base and mineral oil	Apply undiluted	0.30–0.35 gal/sq yd
Lignosulfonate	1 part water to 1 part concentrate	1.0 gal/sq yd
Plant oil	Apply undiluted	0.25–0.50 gal/sq yd
Tall oil pitch rosin	5 parts water to 1 part emulsion for clayey soil and 10 parts water to 1 part emulsion for sandy soil	0.30–1.0 gal/sq yd
Calcium chloride solution (hygroscopic)	Apply undiluted	0.20–0.35 gal/sq yd
Calcium chloride flakes (hygroscopic)	--	1.0–1.5 lb/sq yd
Magnesium chloride (hygroscopic)	Apply undiluted	0.30–0.50 gal/sq yd
Synthetic polymer emulsion	9 parts water to 1 part concentrate	0.50 gal/sq yd

Apply hygroscopic dust suppressants under the manufacturer's instructions.

Apply calcium chloride flakes to a moist surface.

Allow surfaces treated with a dust suppressant to cure before opening them to traffic. Adequate cure occurs when moisture is evaporated, sheen is gone, and tracking is nonextant.

Use the mix proportions and application rate for the corresponding dust control binder as shown in the following table:

Dust Control Binder Application

Dust control binder	Mix proportions	Application rate
Guar	11 to 15 lb per 1,000 gal of water	44–59 lb/acre
Psyllium	Enough water to allow for uniform slurry flow	80–200 lb/acre
Starch	Manufacturer's recommended mix proportions with water	150 lb/acre
Liquid acrylic copolymers and polymers[a]	10 parts water to 1 part polymer	1,175 gal/acre
Liquid methacrylate and acrylate polymers	Manufacturer's recommended mix proportions with water	20 gal/acre
Copolymers of sodium acrylates and acrylamides	Manufacturer's recommended mix proportions with water	3–10 lb/acre
Polyacrylamide and copolymer of acrylamide	10 lb per 1,000 gal of water	5 lb/acre
Hydrocolloid polymers	Manufacturer's recommended mix proportions with water	54–64 lb/acre

[a]Mix and handle the polymeric compound in a manner that will not cause foaming. You may add an antifoaming agent.

Do not allow stormwater runoff from polyacrylamide treated soils unless water passes through:

1. Sediment basin if the total drainage area is greater than or equal to 5 acres.
2. Sediment trap or a series of check dams if the total drainage area is less than 5 acres. Maximize the number of check dams used and space them evenly in the drainage channel such that sediment settlement is maximized.

You may add fibers to dust control binders at a rate of 2,000 lb/acre.

You may reapply dust palliatives at a reduced application rate if authorized.

18-1.04 PAYMENT

Not Used

^^

19 EARTHWORK

10-17-14

Replace "20-3.03B(4)" in the 2nd paragraph of section 19-1.01A with:

07-19-13

20-2.02C(2)

Replace the 3rd paragraph in section 19-2.01A with:

07-19-13

Pavement removal within the limits of roadway excavation must comply with section 15-2.02B.

07-19-13

Delete the 2nd paragraph in section 19-2.03A.

Add to the 2nd paragraph of section 19-2.03D:

10-17-14

Topsoil must comply with section 21.

Replace the 2nd paragraph of section 19-3.01A(2)(b) with:

07-01-11

For cofferdams on or affecting railroad property, allow 85 days for review.

Add to the list in the 1st paragraph of section 19-3.01A(2)(d):

01-20-12

9. Provisions for discontinuous rows of soil nails

Replace "sets" in the 3rd and 4th paragraphs of section 19-3.01A(2)(d) with:

04-19-13

copies

Add to section 19-3.01A(3)(b):

01-20-12

For soil nail walls, wall zones are specified in the special provisions.

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

01-15-16

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

10-30-15

The Engineer performs a progress inspection:

1. Before cultivating work starts
2. During pressure testing of irrigation pipe on the supply side of control valves
3. During testing of low voltage conductors
4. During irrigation system functional tests
5. Before planting work starts
6. After completion of planting work

07-19-13

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

10-30-15

Unless there is a bid item for irrigation water service charges, the Department furnishes water if it is available from an existing Department-owned facility within the project limits or an irrigation system to be installed under the Contract.

07-19-13

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

05-30-14

3. Causing excess runoff

10-30-15

If water use calculations are provided as supplemental project information, water plants under the Model Water Efficient Landscape Ordinance, 23 CA Code of Regs § 490 et seq., and local water agency requirements.

05-30-14

Water plants at night unless otherwise authorized.

07-19-13

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

10-30-15

6. Rain sensors
7. Remote control valves
8. Backflow preventers

07-19-13

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

10-30-15

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.

07-19-13

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.

10-30-15

2. Marked "WATER" in cast-in letters not less than 1 inch high unless shown.

07-19-13

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.

10-30-15

20-2.01B(8) Wye Strainers

Wye strainers, except those used for drip valve assemblies, must:

1. Have a cast iron or all bronze body
2. Have a removable stainless steel strainer screen with 40-mesh woven wire
3. Have a 20-mesh woven wire screen or perforated sheet with 0.045-inch-diameter holes when on a backflow preventer assembly
4. Be capable of withstanding a working pressure of 150 psi
5. Be equipped with a garden valve at the outlet

07-19-13

20-2.01C Construction

20-2.01C(1) General

05-30-14

Immediately shut off water to broken supply lines, valves, or sprinkler assemblies. Repair irrigation systems within 24 hours after a malfunction or damage occurs.

07-19-13

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

10-30-15

Trench and backfill under section 86-2.01.

07-19-13

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.

11-15-13

Trenches for irrigation supply lines and conduits 3 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 2-1/2 inches or less in diameter must be a minimum of 12 inches below finished grade, measured from the top of the installed pipe.

07-19-13

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.

11-15-13

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.

07-19-13

20-2.01C(3) Pull Boxes

10-30-15

Install pull boxes under section 86-2.06 at the following locations:

07-19-13

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.

01-15-16

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. In open areas, install signs on metal posts under section 56-4.

07-19-13

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.

10-30-15

Work performed on existing irrigation facilities must comply with section 15.

07-19-13

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.

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20-2.02C(8) Remove Irrigation Facilities

Irrigation facilities to be removed that are more than 6 inches below the finished grade may be abandoned in place unless salvaging is specified or shown.

Immediately after disconnecting an existing irrigation facility to be removed or abandoned from an existing facility to remain, the remaining facility must be capped or plugged, or connected to a new or existing irrigation facility.

20-2.02C(9) Salvage Irrigation Facilities

Salvage irrigation facilities under section 15-2.03.

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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.

10-30-15

20-2.03B(4) Backflow Preventer Enclosures

Each backflow preventer enclosure must:

1. Be Type 304 stainless steel
2. Have expanded metal side, end, and top panels fabricated from 9-gauge minimum-thickness sheet with openings of approximately 3/4 by 1-3/4 inches
3. Have expanded metal panels attached to the 3/16-inch-thick 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
4. Have lock guards with a minimum thickness of 12 gauge
5. Have hexagonal nuts and lock-type washers
6. Have padlock-clasp or latch-and-lock mechanism

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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

10-30-15

Perform field tests on control and neutral conductors. Field tests must comply with the specifications in section 86-2.14B.

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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

10-30-15

Control and neutral conductors must comply with the requirements in section 86-2.08.

Electrical conduit and fittings must comply with section 86.

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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. Of the size recommended by the manufacturer of the controllers to be installed
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

10-30-15

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.

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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

10-30-15

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

base station: Designated computer that collects data from a series of satellite controllers through a centralized server.

centralized server: Designated server that collects data from all base stations.

network communication: Identified means through which satellite controllers, base stations, and a centralized server communicate to one another, such as fiber optics, spread spectrum, and phone lines.

remote access device: Wireless device, such as an FCC-compliant radio remote, web-enabled smart phone, or wireless computer or tablet, used to communicate with satellite controllers from a remote location.

remote irrigation control system: Centralized water-management system that consists of:

1. Base station
2. Centralized server or web-based application
3. Satellite controllers
4. Remote access device

satellite controller: Irrigation controller that communicates directly to a base station or centralized server.

smart controller: Irrigation controller that estimates or measures depletion of available plant soil moisture in order to operate an irrigation system, replenishing water as needed while minimizing excess water use.

web-based application: Encrypted managing software that is coded in a browser-supported language and is executable via a common Internet web browser, such as Internet Explorer, Firefox, and Safari.

20-2.07A(3) Submittals

Submit a complete manufacturer's maintenance and operations manual for each type of installed controller as an informational submittal.

After the work 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-inch 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.

20-2.07A(4) Quality Control and Assurance

Provide training by a qualified person on the use and adjustment of the installed irrigation controllers at least 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 AC-powered irrigation controllers must operate on 120 V(ac), 60 Hz, and supply from 24 to 30 V(ac), 60 Hz for operating electrical remote control valves.

Concrete for the pad and foundation must be minor concrete except the cementitious material content of the concrete must be at least 463 lb/cu yd. 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 smart controller from a single manufacturer.
2. Be fully automatic and capable of operating a complete 30-day or longer irrigation program.
3. 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.
4. Have nonvolatile memory.
5. Have a watering time display on the face of the control panel.
6. 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.
7. Have a variable or incremental timing adjustment ranging from 1 to 360 minutes per station.
8. Be capable of operating at least 3 program schedules.
9. Be capable of having at least 4 start times per program schedule.
10. Have an output that can energize a pump start circuit or a remote control master valve.
11. Be protected by fuses and circuit breakers.
12. Display a program and station affected by a sensory alert without changing other watering schedules not affected by the alert.
13. Be capable of global manual and automatic seasonal adjustments to all valves in any given program.
14. Automatically change watering schedule based on evapotranspiration data provided by a local weather station or have an internal programmed default of historical evapotranspiration data for a given region.
15. Support a flow sensor, and a rain sensor or access to a weather station, and have automatic shut-off capability.
16. 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 20-2.07B(3).

Irrigation controllers not installed in enclosure cabinets must be weatherproof, constructed of fiberglass or metal and have a door lock with 2 keys provided.

A remote irrigation system must comply with the specifications for 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-secured 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 comply with section 86 and:

1. Be minimum 14-gauge Type 304 stainless steel.
2. Include a mounting panel. Fabricate mounting panels using any of the following materials:
   - 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 if 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 from 24 to 30 V(ac)
2. Wireless and FCC compliant

20-2.07C Construction

Finish the exposed top surface of concrete pad with a medium broom finish applied parallel to the long dimension.

Install electrical components for automatic irrigation systems under section 86-1.02.

Install irrigation controllers under the manufacturer's instructions.

If 2 or more irrigation controllers operate the same remote master control valve, 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 120-volt or higher electrical service is not included in the payment for any type of irrigation controller.

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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.

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Solvent-cemented fittings for schedule 40 plastic pipe supply line must be injection molded PVC, schedule 40, and comply with ASTM D2466.

Solvent-cemented fittings for class 315 plastic pipe supply line must be injection molded PVC, schedule 80, and comply with ASTM D1784 and ASTM D2467.

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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.

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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. Reuse water from waterline flushing for landscape irrigation if practicable.

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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

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Each riser sprinkler assembly must include a riser or flexible hose, threaded nipple, swing joint, 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, swing joint, perforated drainpipe, and drain cap.

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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

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Not Used

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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

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.

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11. Be bottom, angled, or straight inlet configuration.

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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

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All valves must be installed in a valve box with a cover except:

1. Check valves
2. Garden valves
3. Pressure regulating valves installed on backflow preventers

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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

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20-2.12–20-2.13 RESERVED

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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

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Submit nursery invoices showing sizes, quantities, and botanical names of plants, including genus, species, and variety. Include lot numbers for plants grown from the same seed lot or cutting source.

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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.

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

10-30-15

Backfill material for the palm tree planting holes must be 100 percent commercial quality washed plaster sand.

07-19-13

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.

01-15-16

Tree bark mulch must be ground such that at least 95 percent of the material by volume is less than 2 inches in any direction and no more than 30 percent by volume is less than 1 inch in any direction.

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

^^

21 EROSION CONTROL

07-19-13

Replace ", bonded fiber matrix, and polymer-stabilized fiber matrix" in the 1st paragraph of section 21-1.01B with:

04-20-12

and bonded fiber matrix

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

11-15-13

For each field qualification for each 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.

07-19-13

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

^^^

Replace the introductory clause of the 2nd paragraph of section 29-1.03B with:

04-18-14

Equipment for spreading and compacting ATPB must comply with section 39-1.03B. Compact ATPB in 1 layer using one of the following methods:

Replace "3rd" in the 4th paragraph of section 29-1.03C with:

07-19-13

4th

^^

Replace section 30 with:

04-20-12

30 RECLAIMED PAVEMENTS

04-20-12

30-1 GENERAL

30-1.01 GENERAL

Section 30 includes specifications for reclaiming the pavement section and constructing a base.

30-2 FULL DEPTH RECLAIMED—FOAMED ASPHALT

Reserved

30-3–30-6 RESERVED

^^^^^^^^^^^^^^^^^^^

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

03-21-14

Flush coat includes applying a fog seal coat to the surface, followed by sand.

07-19-13

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

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.

03-21-14

Submit a sample of asphaltic emulsion in a 1/2-gallon plastic container to the Engineer and to the authorized laboratory. Each sample must be submitted in an insulated shipping container within 24 hours of sampling.

07-19-13

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.

03-21-14

Within 3 business days of sampling, the authorized laboratory must test the 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
5. Elastic recovery under AASHTO T 301 for polymer asphaltic emulsion

Circulate 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. In the presence of the Engineer take two 1/2-gallon samples every 55 tons or at least 1 day's production.

07-19-13

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

03-21-14

The cleanness value determined under California Test 227 must be 80 or greater.

07-19-13

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:

10-30-15

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
AASHTO T 301 (elastic recovery [a])	For each 1 increment below the min value of 60	1
	For each 2 increment below the min value of 60	3
	For each 3 increment below the min value of 60	10

[a] The highest pay factor applies

07-19-13

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.

03-21-14

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. Elastic recovery determined under AASHTO T 301 must be at least 60 percent.
3. Polymer content in percent by weight does not apply.
4. The ring and ball softening point temperature determined under AASHTO T 53 for Test on Residue from Evaporation Test must comply with the following minimum temperature requirement:
   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

07-19-13

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

03-21-14

The cleanness value determined under California Test 227 must be 86 or greater.

07-19-13

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

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.

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

10-30-15

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 binder seal coat consists of applying 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: Combination of ground or granulated high natural crumb rubber and 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

At least 5 business days before use, submit the permit issued by the local air district for asphalt rubber binder field blending equipment and application equipment. If an air quality permit is not required by the local air district for producing asphalt rubber binder, submit verification from the local air district that an air quality permit is not required.

At least 10 days before starting seal coat activities, submit the name of an authorized laboratory to perform QC testing for asphalt rubber binder. The authorized laboratory must comply with the Department's Independent Assurance Program.

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 a certified volume or weight slip for each delivery of asphalt rubber binder ingredients and asphalt rubber binder.

Submit SDS for each asphalt rubber binder ingredient and the asphalt rubber binder.

At least 15 days before use, submit:

1. Four 1 qt 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, include:
     - 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, include:
     - 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, include:
     - 3.3.1. Test results for the specified quality characteristics
     - 3.3.2. Minimum reaction time and temperature

Submit a certificate of compliance and accuracy verification of test results for viscometers.

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 binder seal coat work.

Submit viscosity rest results within 2 business days after testing.

Submit resilience and softening point test results within 3 business days after testing.

37-2.05B(1)(d) Quality Control and Assurance

37-2.05B(1)(d)(i) General

The equipment used in producing asphalt rubber binder and the equipment used in spreading asphalt rubber binder must be permitted for use by the local air district.

37-2.05B(1)(d)(ii) Quality Control

37-2.05B(1)(d)(ii)(A) General

Reserved

37-2.05B(1)(d)(ii)(B) Asphalt Modifier

Test asphalt modifier under the test methods and frequencies shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Frequency
Viscosity	ASTM D445	1 per shipment
Flash point	ASTM D92	
Molecular analysis Asphaltenes Aromatics	ASTM D2007	1 per shipment

37-2.05B(1)(d)(ii)(C) Crumb Rubber Modifier

Sample and test scrap tire CRM and high natural CRM separately. Test CRM under the test methods and frequencies shown in the following table:

Crumb Rubber Modifier

Quality characteristic	Test method	Frequency
Scrap tire crumb rubber gradation	California Test 385	1 per 250 tons or 1 per project, whichever is greater
High natural crumb rubber gradation	California Test 385	1 per 250 tons or 1 per project, whichever is greater
Wire in CRM	California Test 385	1 per 10,000 lb
Fabric in CRM	California Test 385	
CRM particle length	--	
CRM specific gravity	California Test 208	
Natural rubber content in high natural crumb rubber	ASTM D297	1 per 3,400 lb

37-2.05B(1)(d)(ii)(D) Asphalt Rubber Binder

Test asphalt rubber binder under the test methods and frequencies shown in the following table:

Quality characteristic	Test method	Sampling location	Frequency
Descending viscosity[a]	ASTM D7741/D7741M	Reaction vessel	1 per lot[b]
Viscosity at 375 °F	ASTM D7741/D7741M	Distribution truck	15 minutes before use per lot[b]
Cone penetration	ASTM D217	Distribution truck	1 per lot[b]
Resilience	ASTM D5329		
Softening point	ASTM D36/D36M		

[a]Start taking viscosity readings at least 45 minutes after adding crumb rubber modifier and continue taking viscosity readings every 30 minutes until 2 consecutive descending viscosity readings have been obtained and the final viscosity complies with the specification requirement.
[b]The lot is defined in the Department's *MPQP*.

Retain the sample from each lot. Test for cone penetration, resilience, and softening point for the first 3 lots and if all 3 lots pass, the testing frequency may be reduced to once for every 3 lots.

If QC test results indicate that the asphalt rubber binder does not meet the specifications, take corrective action and notify the Engineer.

37-2.05B(1)(d)(iii) Department Acceptance

37-2.05B(1)(d)(iii)(A) General

Reserved

37-2.05B(1)(d)(iii)(B) Crumb Rubber Modifier

The Department accepts CRM based on the gradation requirements shown in the following table when tested under California Test 385:

Crumb Rubber Modifier Gradation Requirements

Sieve size	Scrap tire crumb rubber		High natural crumb rubber	
	Operating range	Contract compliance	Operating range	Contract compliance
No. 8	100	100	--	--
No. 10	95–100	90–100	100	100
No. 16	35–85	32–88	92–100	85–100
No. 30	2–25	1–30	25–95	20–98
No. 50	0–10	0–15	6–35	2–40
No. 100	0–5	0–10	0–7	0–10
No. 200	0–2	0–5	0–3	0–5

If a test result for CRM gradation does not comply with the specifications, the Department deducts the corresponding amount for each gradation test as shown in the following table:

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

Each gradation test for scrap tire crumb rubber represents 10,000 lbs or the quantity used in that day's production, whichever is less.

Each gradation test for high natural crumb rubber represents 3,400 lbs or the quantity used in that day's production, whichever is less.

37-2.05B(1)(d)(iii)(C) Asphalt Rubber Binder

For Department acceptance testing, take a sample of asphalt rubber binder in the Engineer's presence every 5 lots or once a day, whichever is greater. Each sample must be in a 6 qt can with open top and friction lid.

The Department accepts asphalt rubber binder based on compliance with the requirements shown in the following table:

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–60
Resilience at 25 °C (% rebound)	ASTM D5329	18–50
Softening point (°C)	ASTM D36/D36M	55–88
Viscosity at 375 °F (Pa•s x 10^{-3})[a]	ASTM D7741/D7741M	1,500–2,500

[a]Prepare sample for viscosity test under California Test 388.

37-2.05B(1)(d)(iii)(D) Precoated Screenings

The Department accepts precoated screenings based on compliance with the requirements shown in the following table:

Precoated Screenings Acceptance Criteria

Quality characteristic	Test method	Requirement		
Los Angeles Rattler Loss (max, %) Loss at 100 revolutions Loss at 500 revolutions	California Test 211	 10 40		
Film stripping (max, %)	California Test 302	25		
Cleanness value (min)	California Test 227	80		
Durability (min)	California Test 229	52		
Gradation (% passing by weight) Sieve sizes:	California Test 202	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

37-2.05B(2) Materials

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 comply with the requirements shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Viscosity at 100 °C ($m^2/s \times 10^{-6}$)	ASTM D445	X ± 3 [a]
Flash point (CL.O.C., °C)	ASTM D92	207 min
Molecular analysis Asphaltenes by mass (max, %) Aromatics by mass (min, %)	ASTM D2007	 0.1 55

[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

CRM 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 CRM particles must be large enough to be ground or granulated.

Wire must not be more than 0.01 percent by weight of CRM when tested under California Test 385. CRM must be free of contaminants except fabric, which must not exceed 0.05 percent by weight of CRM.

The length of an individual CRM particle must not exceed 3/16 inch.

CRM must be dry, free-flowing particles that do not stick together. A maximum of 3 percent calcium carbonate or talc by weight of CRM may be added. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier.

Specific gravity of CRM must be from 1.1 to 1.2 determined under California Test 208.

The CRM must comply with the requirements shown in the following table:

Crumb Rubber Modifier Requirements

Quality characteristic	Test method	Requirement	
		Scrap tire crumb rubber	High natural crumb rubber
Acetone extract (%)	ASTM D297	6.0–16.0	4.0–16.0
Rubber hydrocarbon (%)	ASTM D297	42.0–65.0	50.0 min
Natural rubber content (%)	ASTM D297	22.0–39.0	40.0–48.0
Carbon black content (%)	ASTM D297	28.0–38.0	--
Ash content (%)	ASTM D297	8.0 min	--

When tested under California Test 385, scrap tire crumb rubber must comply with the gradation requirements 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

When tested under California Test 385, high natural crumb rubber must comply with the gradation requirements 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

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 CRM. The minimum percentage of CRM must be 20.0 percent and lower values may not be rounded up.

CRM must be 76 ± 2 percent by weight scrap tire crumb rubber and 24 ± 2 percent by weight high natural crumb 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 CRM may be proportioned and combined simultaneously.

The blend of asphalt binder and asphalt modifier must be combined with the CRM at the asphalt rubber binder production site. The asphalt binder and asphalt modifier blend must be from 375 to 440 degrees F when the CRM 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 comply with the requirements shown in the following table:

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–60
Resilience at 25 °C (% rebound)	ASTM D5329	18–50
Softening point (°C)	ASTM D36/D36M	55–88
Viscosity at 375 °F (Pa•s x 10^{-3})[a]	ASTM D7741/D7741M	1,500–2,500

[a]Prepare sample for viscosity test under California Test 388.

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, screenings for asphalt rubber binder seal coat must comply with the gradation requirements shown in the following table:

Asphalt Rubber Binder Seal Coat Screenings Gradation

Percentage passing by weight		
Sieve sizes	Medium 1/2" max	Fine 3/8" max
3/4"	100	100
1/2"	85–90	95–100
3/8"	0–30	70–85
No. 4	0–5	0–15
No. 8	--	0–5
No. 200	0–1	0–1

The seal coat screenings must comply with the requirements shown in the following table:

Seal Coat Screenings

Quality characteristic	Test method	Requirement
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 gauges
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

Precoating of screenings must be performed at a central mixing plant. The plant must be authorized under the Department's Material Plant Quality Program.

For asphalt rubber binder 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 binder 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. The asphalt must be from 0.5 to 1.0 percent by weight of dry screenings. The Engineer determines the exact rate.

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. You may reduce the application rate by 0.050 gal/sq yd in the wheel paths.

Apply asphalt rubber binder when the ambient 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 enough screenings are available at the job site 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 pavement is damp or during high wind conditions. If authorized, you may adjust the distributor bar height and distribution speed and use shielding equipment during high wind conditions.

37-2.05B(3)(e) Screenings Application

During transit, cover precoated screenings for asphalt rubber binder 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 binder 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.

If authorized for final rolling, you may use a steel-wheeled roller weighing from 8 to 10 tons in static mode only.

Perform a final sweeping before Contract acceptance. The final sweeping must not dislodge screenings.

37-2.05B(4) Payment

The payment quantity for precoated screenings is the weight measured after the screenings are preheated and precoated with asphalt binder.

If recorded batch weights are printed automatically, the payment quantity for screenings is the weight determined from the printed batch weights if:

1. Total aggregate weight for the 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. Copy of the recorded batch weights is certified by a licensed weighmaster

Asphalt rubber binder is measured as specified for asphalt binder.

07-19-13

37-2.05C Modified Asphalt Binder Seal Coat

Reserved

03-21-14

37-2.06 STRESS ABSORBING MEMBRANE INTERLAYER

37-2.06A General

Section 37-2.06 applies where a stress absorbing membrane interlayer (SAMI) is shown.

Comply with section 37-2.05B except a flush coat is not required.

37-2.06B Materials

For SAMI, screenings must comply with the 3/8-inch maximum gradation.

37-2.06C Construction

For SAMI, section 37-2.01C(7) does not apply.

Final rolling and sweeping are not required for SAMI.

37-2.06D Payment

Not Used

37-2.07–37-2.10 RESERVED

Add to section 37-3.01D(1):

01-18-13

Micro-surfacing spreader operators must attend the prepaving conference.

^^

39 HOT MIX ASPHALT

01-15-16**Replace the headings and paragraphs in section 39 with:**

04-18-14

39-1 GENERAL

39-1.01 GENERAL

39-1.01A Summary

Section 39-1 includes general specifications for producing and placing hot mix asphalt.

HMA includes one or more of the following types:

1. Type A HMA
2. RHMA-G
3. OGFC
4. BWC
5. Minor HMA

10-30-15

If the use of a warm mix asphalt technology is allowed or required by a special provision, the warm mix asphalt technology to be used must be on the Authorized Materials List for approved technologies.

01-15-16

Wherever reference is made to the following test methods, the year of publication for these test methods is as shown in the following table:

Test method	Year of publication
AASHTO M 17	2011 (2015)
AASHTO M 323	2013
AASHTO R 30	2002 (2015)
AASHTO R 35	2014
AASHTO R 56	2014
AASHTO R 57	2014
AASHTO T 27	2014
AASHTO T 49	2014
AASHTO T 59	2013
AASHTO T 96	2002 (2010)
AASHTO T 164	2014
AASHTO T 176	2008
AASHTO T 209	2012
AASHTO T 269	2014
AASHTO T 275	2007 (2012)
AASHTO T 283	2014
AASHTO T 304	2011
AASHTO T 305	2014
AASHTO T 308	2010
AASHTO T 312	2014
AASHTO T 324	2014
AASHTO T 329	2013
AASHTO T 335	2009
ASTM D36/D36M	$2014^{\varepsilon 1}$
ASTM D92	2012b
ASTM D217	2010
ASTM D297	2013
ASTM D445	2014
ASTM D2007	2011
ASTM D2074	2007 (Reapproved 2013)
ASTM D2995	1999 (Reapproved 2009)
ASTM D4791	2010
ASTM D5329	2009
ASTM D7741/D7741M	$2011^{\varepsilon 1}$
Asphalt Institute MS-2	7th edition (2015)

39-1.01B Definitions

binder replacement: Binder from RAP expressed as a percent of the total binder in the mix.

coarse aggregate: Aggregate retained on a no. 4 sieve.

fine aggregate: Aggregate passing the no. 4 sieve.

leveling course: Thin layer of HMA used to correct minor variations in the longitudinal and transverse profile of the pavement before placement of other pavement layers.

10-30-15

miscellaneous areas: Areas outside the traveled way and shoulders such as:

1. Median areas not including inside shoulders
2. Island areas
3. Sidewalks
4. Gutters
5. Ditches
6. Overside drains
7. Aprons at ends of drainage structures

04-18-14

processed RAP: RAP that has been fractionated.

10-30-15

supplemental fine aggregate: Mineral filler consisting of rock dust, slag dust, hydrated lime, hydraulic cement, or any combination of these and complying with AASHTO M 17.

04-18-14

39-1.01C Submittals

39-1.01C(1) General

Reserved

39-1.01C(2) Job Mix Formula

39-1.01C(2)(a) General

Except for the HMA to be used in miscellaneous areas and dikes, submit your proposed JMF for each type of HMA to be used. The JMF must be submitted on the Contractor Job Mix Formula Proposal form along with:

1. Mix design documentation on Contractor Hot Mix Asphalt Design Data form dated within 12 months of submittal
2. JMF verification on a Caltrans Hot Mix Asphalt Verification form, if applicable
3. JMF renewal on a Caltrans Job Mix Formula Renewal form, if applicable
4. MSDS for:
   - 4.1. Asphalt binder
   - 4.2. Supplemental fine aggregate except fines from dust collectors
   - 4.3. Antistrip additives

The Contractor Hot Mix Asphalt Design Data form must show documentation on aggregate quality.

If you cannot submit a Department-verified JMF on a Caltrans Hot Mix Asphalt Verification form dated within 12 months before HMA production, the Engineer verifies the JMF.

Submit a new JMF if you change any of the following:

1. Target asphalt binder percentage greater than ±0.2 percent
2. Asphalt binder supplier
3. Combined aggregate gradation
4. Aggregate sources
5. Liquid antistrip producer or dosage
6. Average binder content in a new fractionated RAP stockpile by more than ±2.00 percent from the average RAP binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form
7. Average maximum specific gravity in a new fractionated RAP stockpile by more than ±0.060 from the average maximum specific gravity value reported on page 4 of your Contractor Hot Mix Asphalt Design Data form
8. Any material in the JMF

Allow the Engineer 5 business days from a complete JMF submittal for document review of the aggregate qualities, mix design, and JMF. The Engineer notifies you if the proposed JMF submittal is accepted.

10-30-15

If your JMF fails verification testing, submit an adjusted JMF based on your testing. The adjusted JMF must include a new Contractor Job Mix Formula Proposal form, Contractor Hot Mix Asphalt Design Data form, and the results of the failed verification testing.

04-18-14

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.

39-1.01C(2)(b) Job Mix Formula Renewal

You may request a JMF renewal by submitting:

1. Proposed JMF on a Contractor Job Mix Formula Proposal form
2. Previously verified JMF documented on a Caltrans Hot Mix Asphalt Verification form dated within 12 months
3. Mix design documentation on a Contractor Hot Mix Asphalt Design Data form used for the previously verified JMF

39-1.01C(2)(c) Job Mix Formula Modification

For an authorized JMF, submit a modified JMF if you change any of the following:

1. Asphalt binder supplier
2. Liquid antistrip producer
3. Liquid antistrip dosage

You may change any of the above items only once during the Contract.

Submit your modified JMF request a minimum of 15 days before production. Each modified JMF submittal must consist of:

1. Proposed modified JMF on Contractor Job Mix Formula Proposal form, marked *Modified*.
2. Mix design records on Contractor Hot Mix Asphalt Design Data form for the authorized JMF to be modified.
3. JMF verification on Hot Mix Asphalt Verification form for the authorized JMF to be modified.
4. Test results for the modified JMF in compliance with the mix design specifications. Perform tests at the mix design OBC as shown on the Contractor Asphalt Mix Design Data form.

With an accepted modified JMF submittal, the Engineer verifies each modified JMF within 10 days of receiving all verification samples.

39-1.01C(3) Quality Control Plan

With your proposed JMF submittal, submit a QC plan for HMA.

The QC plan must describe the organization and procedures for:

1. Controlling HMA quality characteristics
2. Taking samples, including sampling locations
3. Establishing, implementing, and maintaining QC
4. Determining when corrective actions are needed
5. Implementing corrective actions
6. Methods and materials for backfilling core locations

The QC plan must address the elements affecting HMA quality including:

1. Aggregate
2. Asphalt binder
3. Additives
4. Production
5. Paving

The QC plan must include aggregate QC sampling and testing during lime treatment.

The Engineer reviews the QC plan within 5 business days from the submittal. Do not start HMA production until the Engineer authorizes the plan.

10-30-15

If QC procedures, personnel, or sample testing locations change, submit a QC plan supplement at least 3 business days before implementing the proposed change. Do not implement the change without authorization.

04-18-14

39-1.01C(4) Test Results

For mix design, JMF verification, production start-up, and each 10,000 tons, submit AASHTO T 283 and AASHTO T 324 (Modified) test results to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Submit all QC test results, except AASHTO T 283 and AASHTO T 324 (Modified), within 3 business days of a request. Submit AASHTO T 283 QC tests within 15 days of sampling.

For tests performed under AASHTO T 324 (Modified), submit test data and 1 tested sample set within 5 business days of sampling.

If coarse and fine durability index tests are required, submit test results within 2 business days of testing.

10-30-15

If a tapered notched wedge is used, submit compaction test result values within 24 hours of testing.

04-18-14

39-1.01C(5) Reserved

39-1.01C(6) Liquid Antistrip Treatment

If liquid antistrip treatment is used, submit the following with your proposed JMF submittal:

1. One 1-pint sample
2. Infrared analysis including copy of absorption spectra
3. Certified copy of test results
4. Certificate of compliance for each liquid antistrip shipment. On each certificate of compliance, include:
   - 4.1. Your signature and printed name
   - 4.2. Shipment number
   - 4.3. Material type
   - 4.4. Material specific gravity
   - 4.5. Refinery
   - 4.6. Consignee
   - 4.7. Destination
   - 4.8. Quantity
   - 4.9. Contact or purchase order number
   - 4.10. Shipment date
5. Proposed proportions for liquid antistrip

For each delivery of liquid antistrip to the HMA production plant, submit a 1-pint sample to METS. Submit shipping documents. Label each liquid antistrip sampling container with:

1. Liquid antistrip type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with 1 separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each HMA mixing plant type, submit the following information in the order specified:

1. For batch plant mixing:
   - 1.1. Production date
   - 1.2. Time of batch completion
   - 1.3. Mix size and type
   - 1.4. Each ingredient's weight
   - 1.5. Asphalt binder content as a percentage of the total weight of mix
   - 1.6. Liquid antistrip content as a percentage of the asphalt binder weight
2. For continuous mixing plant:
   - 2.1. Production date

2.2. Data capture time
2.3. Mix size and type
2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
2.5. Aggregate moisture content as percentage of the dry aggregate weight
2.6. Flow rate of asphalt binder collected from the asphalt binder meter
2.7. Flow rate of liquid antistrip collected from the liquid antistrip meter
2.8. Asphalt binder content as percentage of the total weight of mix calculated from:
    2.8.1. Aggregate weigh belt output
    2.8.2. Aggregate moisture input
    2.8.3. Asphalt binder meter output
2.9. Liquid antistrip content as percentage of the asphalt binder weight calculated from:
    2.9.1. Asphalt binder meter output
    2.9.2. Liquid antistrip meter output

39-1.01C(7) Lime Treatment

If aggregate lime treatment is used, submit the following with your proposed JMF submittal and each time you produce lime-treated aggregate:

1. Exact lime proportions for fine and coarse virgin aggregate
2. If marination is required, the averaged aggregate quality test results within 24 hours of sampling
3. For dry lime aggregate treatment, a treatment data log from the dry lime and aggregate proportioning device in the following order:
    3.1. Treatment date
    3.2. Time of day the data is captured
    3.3 Aggregate size being treated
    3.4. HMA type and mix aggregate size
    3.5. Wet aggregate flow rate collected directly from the aggregate weigh belt
    3.6. Aggregate moisture content, expressed as a percent of the dry aggregate weight
    3.7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
    3.8. Dry lime flow rate
    3.9. Lime ratio from the authorized JMF for each aggregate size being treated
    3.10. Lime ratio from the authorized JMF for the combined aggregate
    3.11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate weight
    3.12. Calculated difference between the authorized lime ratio and the actual lime ratio
4. For lime slurry aggregate treatment, a treatment data log from the slurry proportioning device in the following order:
    4.1. Treatment date
    4.2. Time of day the data is captured
    4.3. Aggregate size being treated
    4.4. Wet aggregate flow rate collected directly from the aggregate weigh belt
    4.5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate weight
    4.6. Dry aggregate flow rate calculated from the wet aggregate flow rate
    4.7. Lime slurry flow rate measured by the slurry meter
    4.8. Dry lime flow rate calculated from the slurry meter output
    4.9. Authorized lime ratio for each aggregate size being treated
    4.10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate weight
    4.11. Calculated difference between the authorized lime ratio and the actual lime ratio
    4.12. Dry lime and water proportions at the slurry treatment time

Each day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on 1 line. The reported data must include data titles at least once per report.

39-1.01C(8) Warm Mix Asphalt Technology

If a warm mix asphalt technology is used, submit the following with your proposed JMF submittal:

1. MSDS for warm mix asphalt technology

10-17-14

2. For warm mix asphalt water injection foam technology:
   2.1. Name of technology
   2.2. Proposed foaming water content
   2.3. Proposed HMA production temperature range
   2.4. Certification from binder supplier stating no antifoaming agent is used.

04-18-14

3. For warm mix asphalt additive technology:
   3.1. Name of technology
   3.2. Percent admixture by weight of binder and percent admixture by total weight of HMA as recommended by the manufacturer
   3.3. Methodology for inclusion of admixture in laboratory-produced HMA
   3.4. Proposed HMA production temperature range

Collect and hold data for the duration of the Contract and submit the electronic media, daily and upon request. The snapshot of production data must include the following:

1. Date of production
2. Production location
3. Time of day the data is captured
4. HMA mix type being produced and target binder rate
5. HMA additive type, brand, and target rate
6. Temperature of the binder and HMA mixture
7. For a continuous mixing plant, the rate of flow of the dry aggregate calculated from the wet aggregate flow rate as determined by the conveyor scale
8. For a continuous mixing plant, the rate of flow of the asphalt meter
9. For a continuous mixing plant, the rate of flow of HMA additive meter
10. For batch plant mixing, actual batch weights of all ingredients
11. Dry aggregate to binder ratio calculated from metered ingredient output
12. Dry aggregate to HMA additive ratio calculated from metered output

At the end of each day's production shift, submit electronic and printed media from the HMA plant process controller. Present data on electronic media in comma-separated values or tab-separated values format. The captured data for the ingredients represented by production snapshot must have allowances for sufficient fields to satisfy the amount of data required by these specifications and include data titles at least once per report.

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39-1.01C(9)–39-1.01C(11) Reserved

39-1.01C(12) Data Cores

Section 39-1.01C(12) applies if a bid item for data core is shown on the Bid Item List.

Submit a summary of data cores taken and a photograph of each data core to the Engineer and to:

Coring@dot.ca.gov

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:
   7.1. For recovered material, 1/2 inch
   7.2. For unstabilized material, 1.0 inch
8. Location including:
   8.1. County

8.2. Route
8.3. Post mile
8.4. Lane number
8.5. Lane direction
8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. Core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

39-1.01C(13) Pavement Smoothness

39-1.01C(13)(a) General

Reserved

39-1.01C(13)(b) Straightedge Measurements

Within 2 business days of performing straightedge measurements, submit areas requiring smoothness correction. Identify locations of smoothness 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 (i.e., 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

39-1.01C(13)(c) Inertial Profiler Certification

At least 5 business days before the start of initial profiling or changing inertial profiler or operator, submit:

1. Inertial profiler certification issued by the Department.
2. Operator certification for the inertial profiler issued by the Department.
3. List of manufacturer's recommended test procedures for the inertial profiler 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 to the Engineer and to the electronic mailbox address:

smoothness@dot.ca.gov

39-1.01C(13)(d) Inertial Profiler Data

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At least 15 days before inertial profiling, you must register with the Department's secure file sharing system. To obtain information on the registration process, send an e-mail with your contact information to the following electronic mailbox address:

smoothness@dot.ca.gov

Within 2 business days after each day of profiling, submit the profile information to the Engineer and to the Department's secure file sharing system. After submitting the profile information to the Department's file sharing system, send a notification of your electronic submittal to the Engineer and to the above electronic mailbox address with the names of the files submitted.

The profiling information must include:

1. Raw profile data for each lane.
2. ProVAL ride quality analysis report for the International Roughness Index of the left and right wheel paths of each lane. Submit each report as a PDF file.
3. ProVAL ride quality analysis report for the Mean Roughness Index of each lane. Submit each report as a PDF file.
4. ProVAL smoothness assurance analysis report for the International Roughness Index of the left and right wheel paths of each lane. Submit each report as a PDF file.
5. ProVAL smoothness assurance analysis reports for the grinding locations of the left and right wheel paths of each lane. Submit each report as a PDF file.
6. GPS data file for each lane. Submit the data file in GPS eXchange file format.
7. Manufacturer's recommended calibration and verification test results for the inertial profiler.
8. Inertial profiler's calibration and verification test results, including bounce, block, and distance measurement instrument.

Submit the raw profile data in an unfiltered electronic pavement profile file format. Use the following file-naming convention:

YYYYMMDD_TTCCCRRR_EA_D_L_W_B_E_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
EA = Contract number, excluding district identification number, expressed as 6 characters
D = traffic direction, *NB*, *SB*, *WB*, or *EB*
L = lane number from left to right in the direction of travel
W = wheel path, *L* for left, *R* for right, or *B* for both
B = beginning station to the nearest foot, such as 10+20, or beginning post mile to the nearest hundredth, such as 25.06, no leading zero
E = ending station to the nearest foot, such as 14+20, or ending post mile to the nearest hundredth, such as 28.06, no leading zero
X = profile operation, *EXIST* for existing pavement, *INTER* for after prepaving smoothness correction, *PAVE* for after paving, and *CORR* for after final surface pavement correction
PT = type of HMA pavement, such as Type A HMA or RHMA-G

If submitting multiple inertial profiler data files, compress the files into a zip format and submit them using the file-naming convention TT_EA_X_YYYYMMDD.zip.

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39-1.01C(13)(e) Reserved

39-1.01C(14)–39-1.01C(15) Reserved

39-1.01D Quality Control and Assurance

39-1.01D(1) General

When testing under AASHTO T 324 (Modified), test under AASHTO T 324 with the following parameters:

1. Target air voids must equal 7.0 ± 1.0 percent
2. Specimen height must be 60 ± 1 mm
3. Number of test specimens must be 4 (2 test sets)
4. Do not average test sets

5. Test specimen must be a 150 mm gyratory compacted specimen
6. Test temperature must be set at:
   6.1. 113 ± 2 degrees F for PG 58
   6.2. 122 ± 2 degrees F for PG 64
   6.3. 131 ± 2 degrees F for PG 70 and above

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7. Measurements for impression must be taken at every 100 passes along the total length of sample
8. Inflection point defined as the number of wheel passes at the intersection of the creep slope and the stripping slope at maximum rut depth
9. Testing shut off must be set at 25,000 passes
10. Submersion time for samples must not exceed 4 hours

04-18-14

Take samples under California Test 125.

39-1.01D(2) Job Mix Formula Verification

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The Engineer verifies the JMF from samples taken from HMA produced by the plant to be used. The production set point at the plant must be within ±0.2 from the asphalt binder percentage target value shown in your Contractor Job Mix Formula Proposal form. Notify the Engineer at least 2 business days before sampling materials. Samples may be taken from a different project including a non-Department project if you make arrangements for the Engineer to be present during sampling.

04-18-14

In the Engineer's presence and from the same production run, take samples of:

1. Aggregate. Coarse, fine, and supplemental fine aggregate must be taken from the combined cold feed belt, or hot bins. If lime treatment is required, samples must be taken from individual stockpiles before lime treatment. Samples must be at least 120 lb for each coarse aggregate, 80 lb for each fine aggregate, and 10 lb for each type of supplemental fine aggregate. For hot bin samples, the Department combines these aggregate samples to comply with the TV submitted on a Contractor Job Mix Formula Proposal form.
2. Asphalt binder. Take 2 samples minimum. Each sample must be in a 1-quart cylindrical-shaped can with an open top and friction lid. If the asphalt binder is modified or rubberized, the asphalt binder must be sampled with the components blended in the proportions to be used.
3. RAP. RAP samples must be at least 50 lb from each fractionated stockpile used or 100 lb from the belt.
4. Plant-produced HMA. The HMA samples must be at least 250 lb.

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For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 parts and keep 1 part.

After acceptance of the JMF submittal, the Engineer verifies each proposed JMF within 20 days of receiving all verification samples.

For JMF verification, the Engineer tests the following for compliance with the specifications:

1. Aggregate quality
2. Aggregate gradation
3. Voids in mineral aggregate on laboratory-produced HMA must comply with the mix design specifications for voids in mineral aggregate
4. HMA quality characteristics for Department acceptance

To verify the HMA for air voids, voids in mineral aggregate, and dust proportion, the Engineer uses an average of 3 briquettes. The Engineer tests plant-produced material.

If the Engineer verifies the JMF, the Engineer furnishes you a Hot Mix Asphalt Verification form.

If the Engineer's test results on plant-produced samples do not show compliance with the specifications, the Engineer notifies you. Adjust your JMF based on your testing unless the Engineer authorizes reverification without adjustments. JMF adjustments may include a change in:

1. Asphalt binder content target value up to ±0.20 percent from the OBC value submitted on Contractor Hot Mix Asphalt Design Data form
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation table

You may adjust the JMF only once due to a failed verification test.

For each HMA type and aggregate size specified, the Engineer verifies up to 2 proposed JMF submittals including a JMF adjusted after verification failure. If you submit more than 2 JMFs for each type of HMA and aggregate size, the Engineer deducts $3,000 from payments for each verification exceeding this limit. This deduction does not apply to verifications initiated by the Engineer or if a JMF expires while HMA production is stopped longer than 30 days.

A verified JMF is valid for 12 months.

39-1.01D(3) Job Mix Formula Authorization

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 authorizes the verified JMF

39-1.01D(4) Job Mix Formula Renewal

For a JMF renewal and upon request, in the Engineer's presence and from the same production run, take samples of:

1. Aggregate. Coarse, fine, and supplemental fine aggregate must be taken from combined cold-feed belt, or hot bins. If lime treatment is required, samples must be taken from individual stockpiles before lime treatment. Samples must be at least 120 lb for each coarse aggregate, 80 lb for each fine aggregate, and 10 lb for each type of supplemental fines. For hot bins, the Department combines these aggregate samples to comply with the TV submitted on a Contractor Job Mix Formula Proposal form.
2. Asphalt binder. Take 2 samples minimum. Each sample must be in a 1-quart cylindrical-shaped can with an open top and friction lid. If the asphalt binder is modified or rubberized, the asphalt binder must be sampled with the components blended in the proportions to be used.
3. RAP. RAP samples must be at least 50 lb from each fractionated stockpile.
4. Plant-produced HMA. The HMA samples must be at least 250 lb.

Notify the Engineer at least 2 business days before sampling materials. For aggregate, RAP, and HMA, split samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

Allow the Engineer 5 business days from a complete JMF reverification submittal for document review of the aggregate qualities, mix design, and JMF.

The most recent aggregate quality test results within the past 12 months may be used for verification of JMF renewal or upon request, the Engineer may perform aggregate quality tests for verification of JMF renewal.

The Engineer verifies the JMF for renewal under section 39-1.01D(2) except:

1. The Engineer keeps the samples until you provide test results for your part on a Contractor Job Mix Formula Renewal form.
2. The Department tests samples of materials obtained from the HMA production unit after you submit test results that comply with the mix design specifications.
3. After completion of the JMF verification renewal document review, the Engineer verifies each proposed JMF within 20 days of receiving the verification renewal samples and the complete Contractor Job Mix Formula Renewal form.
4. You may not adjust the JMF due to a failed verification.

5. For each HMA type and aggregate gradation specified, the Engineer verifies at no cost to you 1 proposed JMF renewal within a 12-month period.

If the Engineer verifies the JMF renewal, the Engineer furnishes you a Hot Mix Asphalt Verification form. The Hot Mix Asphalt Verification form is valid for 12 months.

39-1.01D(5) Job Mix Formula Modification

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. The Engineer tests verification samples for compliance with:

1. Hamburg wheel track mix design specifications
2. Air void content
3. Voids in mineral aggregate on plant-produced HMA mix design specifications
4. Dust proportion mix design specifications

The Engineer may test for moisture susceptibility for compliance with the mix design specifications.

If the modified JMF is verified, the Engineer revises your Hot Mix Asphalt Verification form to include the new asphalt binder source, new liquid antistrip producer, or new liquid antistrip dosage. 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 JMF modification.

39-1.01D(6) Certifications

39-1.01D(6)(a) General

Laboratories testing aggregate and HMA qualities used to prepare the mix design and JMF must be qualified under AASHTO Materials Reference Laboratory program and the Department's Independent Assurance Program.

39-1.01D(6)(b) Hot Mix Asphalt Plants

Before production, the HMA plant must have a current qualification under the Department's Material Plant Quality Program.

39-1.01D(6)(c) Inertial Profiler Certifications

The inertial profiler equipment must display a current certification decal with expiration date.

The inertial profiler operator and device certifications must be not more than 12 months old.

The operator must be certified for each different model of inertial profiler device operated.

39-1.01D(6)(d)–39-1.01D(6)(e) Reserved

39-1.01D(7) Prepaving Meeting

Meet with the Engineer at a prepaving meeting at a mutually agreed time and place. Discuss the QC plan and the methods of performing HMA production and paving work.

The following personnel must attend the prepaving meeting:

1. Project manager
2. Superintendent
3. HMA plant manager
4. HMA paving foreman

If a warm mix asphalt technology is used, a technical representative for warm mix asphalt technology must attend the prepaving meeting.

39-1.01D(8) Quality Control

39-1.01D(8)(a) General

QC test results must comply with the specifications for Department acceptance.

Prepare 3 briquettes for air voids content and voids in mineral aggregate determination. Report the average of 3 tests.

Except for smoothness, if 2 consecutive QC test results or any 3 QC test results for 1 day's production do not comply with the materials specifications:

1. Stop HMA production
2. Notify the Engineer
3. Take corrective action
4. Demonstrate compliance with the specifications before resuming production and placement

For QC tests performed under AASHTO T 27, results are considered 1 QC test regardless of number of sieves out of compliance.

Do not resume production and placement until the Engineer authorizes your corrective action proposal.

39-1.01D(8)(b) Reserved

39-1.01D(8)(c) Aggregate

39-1.01D(8)(c)(i) General

Reserved

39-1.01D(8)(c)(ii) Aggregate Lime Treatments

If lime treatment is required, sample coarse and fine aggregate from individual stockpiles before lime treatment. Combine aggregate in the JMF proportions. Test the aggregate under the test methods and frequencies shown in the following table:

10-30-15

Aggregate Quality Control During Lime Treatment

Quality characteristic	Test method	Minimum sampling and testing frequency
Sand equivalent[a, b]	AASHTO T 176	1 per 750 tons of untreated aggregate
Percent of crushed particles	AASHTO T 335	1 per 10,000 tons or 2 per project whichever is greater
Los Angeles Rattler	AASHTO T 96	
Fine aggregate angularity	AASHTO T 304 Method A	
Flat and elongated particles	ASTM D4791	

[a]Report test results as the average of 3 tests from a single sample.
[b]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.

For lime slurry aggregate treatment, determine the aggregate moisture content at least once every 2 hours of treatment. Calculate moisture content under AASHTO T 255 and report it as a percent of dry aggregate weight. Use the moisture content calculations as a set point for the proportioning process controller.

04-18-14

The device controlling lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the quantity produced 5 minutes before and 5 minutes after the capture time. For the duration of the Contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate a deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and take corrective action.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates a deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use that day's treated aggregate in HMA.

The Engineer may order you to stop aggregate treatment activities for any of following:

1. You fail to submit treatment data log
2. You fail to submit aggregate QC data for marinated aggregate
3. You submit incomplete, untimely, or incorrectly formatted data
4. You do not take corrective actions
5. You take late or unsuccessful corrective actions
6. You do not stop treatment when proportioning tolerances are exceeded
7. You use malfunctioning or failed proportioning devices

If you stop treatment for noncompliance, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

39-1.01D(8)(d) Liquid Antistrip Treatment

For continuous mixing or batch-plant mixing, sample asphalt binder before adding liquid antistrip. For continuous mixing, sample the combined asphalt binder and liquid antistrip after the static mixer.

39-1.01D(8)(e) Production Start-up Evaluation

You and the Engineer evaluate HMA production and placement at production start-up.

Within the first 750 tons produced on the 1st day of HMA production, in the Engineer's presence, and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from the combined cold-feed belt or hot bin. Take RAP samples from the RAP system.

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 parts to the Engineer and keep 1 part.

You and the Engineer must test the samples and report test results, except for AASHTO T 324 (Modified) and AASHTO T 283 test results, within 5 business days of sampling. For AASHTO T 324 (Modified) and AASHTO T 283 test results, report test results within 15 days of sampling. If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results.

Take one 4- or 6-inch diameter density core for each 250 tons or portion thereof of HMA placed. For each density core, the Engineer reports the bulk specific gravity determined under AASHTO T 275, Method A, in addition to the percent of theoretical maximum density.

39-1.01D(8)(f) Hot Mix Asphalt Density

During HMA placement determine HMA density using a nuclear gauge. On the 1st day of production, develop a correlation factor between cores and nuclear gauge under California Test 375.

Test for in-place density using cores and a nuclear gauge. Test at random locations you select and include the test results in your QC production tests reports.

39-1.01D(8)(g) Tapered Notched Wedge

Perform QC testing on the completed tapered notched wedge joint as follows:

10-30-15

1. Perform density tests using a calibrated nuclear gage at a rate of 1 test for every 750-foot section along the joint. Select random locations for testing within each 750-foot section.
2. Perform density 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 theoretical maximum density.
4. Determine percent compaction of the longitudinal joint as the ratio of the daily average density to the maximum density test results.

04-18-19

Determine percent compaction values each day the tapered notched wedge joint is completed. 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 comply with the specifications.

39-1.01D(8)(h) Density Cores

10-30-15

Except for HMA pavement placed using method compaction, take 4- or 6-inch diameter density cores at least once every 5 business days. Take 1 density core for every 250 tons of HMA from random locations the Engineer selects. Take density cores in the Engineer's presence, and backfill and compact holes with authorized material. Before submitting a density core, mark it with the density core's location and place it in a protective container.

04-18-14

If a density core is damaged, replace it with a density core taken within 1 foot longitudinally from the original density core. Relocate any density core located within 1 foot of a rumble strip to 1 foot transversely away from the rumble strip.

For a tapered notched wedge joint, take 4- or 6-inch diameter density cores 6 inches from the upper vertical notch of the completed longitudinal joint for every 3,000 feet at locations selected by the Engineer. Take cores after the adjacent lane is placed and before opening the pavement to traffic. Take cores in the presence of the Engineer, and backfill and compact holes with authorized material. Before submitting a density core, mark it with the core's location and place it in a protective container.

39-1.01D(8)(i) Reserved

39-1.01D(8)(j) Pavement Smoothness

39-1.01D(8)(j)(i) General

Test pavement smoothness using an inertial profiler except use a 12-foot straightedge for the HMA pavement at the following locations:

1. Traffic lanes less than 1,000 feet in length including ramps, turn lanes, and acceleration and deceleration lanes
2. HMA pavement within 3 feet from and parallel to the construction joint formed between curbs, gutters, or existing pavement
3. Areas within 15 feet of manholes
4. Shoulders
5. Weigh-in-motion areas
6. Miscellaneous areas such as medians, gore areas, turnouts, and maintenance pullouts

10-30-15

Where inertial profiler testing is required:

1. Determine the pavement smoothness for each traffic lane by obtaining the International Roughness Index for the left and right wheel paths in an individual lane. The average of the International Roughness Index values for the left and right wheel paths for the same traffic lane is the Mean Roughness Index of the lane. The wheel paths are a pair of lines 3 feet from and parallel to the edge of a traffic lane. Left and right wheel paths are based on the direction of travel.
2. Identify the areas of localized roughness using the FHWA's engineering software ProVAL to perform smoothness assurance analysis. Calculate the continuous International Roughness Index values for each wheel path with a 25-foot interval using a 250 mm filter.

Collect profiling data under AASHTO R 56 and analyze data using 250 mm and International Roughness Index filters.

Where OGFC is required, test pavement smoothness of the final HMA or concrete pavement surface before placing OGFC and after placing OGFC.

04-18-14

39-1.01D(8)(j)(ii) Inertial Profiler Calibration and Verification Tests

Operate the inertial profiler according to the manufacturer's instructions and AASHTO R 57 at 1-inch recording intervals.

Notify the Engineer 2 business days before performing inertial profiler calibration and verification testing.

Conduct the following inertial profiler calibration and verification tests in the Engineer's presence each day before performing inertial profiling:

1. Block test. Verify the height sensor accuracy under California Test 387.
2. Bounce test. Verify the combined height sensor and accelerometer accuracy under California Test 387.

10-30-15

3. Distance measurement index test. Verify the accuracy of the distance measuring instrument under California Test 387.

04-18-14

4. Manufacturer's recommended tests.

Conduct cross-correlation inertial profiler verification test in the Engineer's presence before performing initial profiling. Verify cross-correlation inertial profiler verification test at least annually. Conduct 5 repeat runs of the inertial profiler on an authorized test section. The test section must be on an existing asphalt concrete pavement surface 0.1 mile long. Calculate a cross-correlation to determine the repeatability of your device under California Test 387 using ProVAL profiler certification analysis with a 3 feet maximum offset. The cross-correlation must be a minimum of 0.92.

39-1.01D(8)(j)(iii) Smoothness Testing

Notify the Engineer of start location by station and start time at least 2 business days before profiling.

Remove foreign objects on the pavement surface before profiling.

Mark the beginning and ending station on the pavement shoulder before profiling. Stationing must be the same when profiling more than one surface.

While collecting the profile data to determine the International Roughness Index values, 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

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4. Begin and end of all at-grade intersections

04-18-14

Determine the Mean Roughness Index for 0.1-mile fixed sections using the ProVAL ride quality analysis with a 250 mm filter. Profile the left and right wheel paths of each lane. Calculate the Mean Roughness Index of each lane. A partial section less than 0.1 mile that is the result of an interruption to continuous pavement surface must comply with the Mean Roughness Index specifications for a full section. Adjust the Mean Roughness Index for a partial section to reflect a full section based on the proportion of a section paved.

Determine the areas of localized roughness using a continuous International Roughness Index for each wheel path with a 25-foot interval using a 250 mm filter.

39-1.01D(9) Department Acceptance

39-1.01D(9)(a) General

The Department tests treated aggregate for acceptance before lime treatment except for gradation.

The Engineer takes HMA samples for AASHTO T 283 and AASHTO T 324 (Modified) from one of the following:

10-17-14

1. At the plant
2. At the truck
3. Windrow

The Engineer takes HMA samples for all other tests from one of the following:

1. At the plant
2. At the truck
3. Windrow
4. Mat behind the paver

10-30-15

To obtain workability of the HMA sample for splitting, the Engineer reheats each sample of HMA mixture not more than 2 cycles. Each reheat cycle is performed by placing the loose mixture in a mechanical forced-draft oven for 2 hours or less after the sample reaches 140 degrees F.

The Engineer conditions each at-the-plant sample of HMA mixture in compliance with sections 7.1.2, 7.1.3, and 7.1.4 of AASHTO R 30.

04-18-14

The Engineer's sampling and testing is independent of your QC sampling and testing.

If you request, the Engineer splits samples and provides you with a part.

No single test result may represent more than 750 tons or one day's production, whichever is less, excluding AASHTO T 283 and AASHTO T 324 (Modified).

Except for smoothness, if 2 consecutive Department acceptance test results or any 3 Department acceptance test results for 1 day's production do not comply with the specifications:

1. Stop HMA production
2. Take corrective action
3. Demonstrate compliance with the specifications before resuming production and placement

10-17-14

For Department acceptance tests performed under AASHTO T 27, results are considered 1 Department acceptance test regardless of the number of sieves out of compliance.

04-18-14

The Engineer accepts HMA based on:

1. Authorized JMF
2. Authorized QC plan
3. Asphalt binder compliance
4. Asphalt emulsion compliance
5. Visual inspection
6. Pavement smoothness

39-1.01D(9)(b) In-Place Density

10-17-14

Except for HMA pavement placed using method compaction, the Engineer tests the density core you take from each 250 tons of HMA. The Engineer determines the percent of theoretical maximum density for each density core by determining the density core's density and dividing by the theoretical maximum density.

Density cores must be taken from the final layer, cored through the entire pavement thickness shown. Where OGFC is required, take the density cores before placing OGFC.

If the percent of theoretical maximum density does not comply with the specifications, the Engineer may accept the HMA and take a payment deduction as shown in the following table:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA percent of maximum theoretical density	Reduced payment factor	HMA percent of maximum theoretical density	Reduced payment factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and replace	> 99.0	Remove and replace

For acceptance of a completed tapered notched wedge joint, the Engineer determines density from cores you take every 3,000 feet.

39-1.01D(9)(c) Pavement Smoothness

For areas that require pavement smoothness determined using an inertial profiler, the pavement surface must:

1. Have no areas of localized roughness with an International Roughness Index greater than 160 in/mi
2. Comply with the Mean Roughness Index requirements shown in the following table for a 0.1 mile section:

HMA Pavement Smoothness Acceptance Criteria

HMA thickness	Mean Roughness Index requirement
> 0.20 foot	60 in/mi or less
≤ 0.20 foot	75 in/mi or less

Note: These requirements do not apply to the OGFC surface. Smoothness requirements for OGFC are specified in section 39-4.01D(3)(c).

Where OGFC is required, the final HMA surface must comply with the Mean Roughness Index requirements before placing OGFC. Correct the pavement surface that does not meet the Mean Roughness Index specifications. Areas of localized roughness greater than 160 in/mi must be corrected regardless of the Mean Roughness Index values of a 0.1-mile section.

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For areas that require pavement smoothness determined using a 12-foot straightedge, the HMA 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

Pavement smoothness may be accepted based on your testing in the absence of the Department's testing.

For each 0.1 mile section, your International Roughness Index values must be within 10 percent of the Department's International Roughness Index values. The Engineer may order you to recalibrate your inertial profiler equipment and reprofile. If your results are inaccurate due to operator error, the Engineer may disqualify your inertial profiler operator.

39-1.01D(9)(d) Dispute Resolution

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer within 5 business days of receiving a test result if you dispute the test result.

If you or the Engineer dispute the other's test results, submit your test results and copies of paperwork including worksheets used to determine the disputed test results. An independent third party performs referee testing. Before the third party participates in a dispute resolution, it must be qualified under AASHTO Materials Reference Laboratory program, and the Department's Independent Assurance Program. The independent third party must have no prior direct involvement on this Contract. By mutual agreement, the independent third party is chosen from:

1. Department laboratory in a district or region not in the district or region the project is located
2. Transportation Laboratory
3. Laboratory not currently employed by you or your HMA producer

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If the Department's portion of the split QC samples or acceptance samples are not available, the independent third party uses any available material representing the disputed HMA for evaluation.

For a dispute involving JMF verification, the independent third party performs referee testing as specified in the 5th paragraph of section 39-1.01D(2).

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If the independent third party determines the Department's test results are valid, the Engineer deducts the independent third party's testing costs from payments. If the independent third party determines your test results are valid, the Department pays the independent third party's testing costs.

39-1.02 MATERIALS

39-1.02A General

Reserved

39-1.02B Mix Design

39-1.02B(1) General

The HMA mix design must comply with AASHTO R 35 except:

1. Notes 3, 6, and 10 do not apply
2. AASHTO M 323 does not apply on combinations of aggregate gradation and asphalt binder contents to determine the OBC and HMA mixture qualities

The Contractor Hot Mix Asphalt Design Data form must show documentation on aggregate quality.

39-1.02B(2) Hot Mix Asphalt Treatments

If the test results for AASHTO T 283 or AASHTO T 324 (Modified) for untreated plant-produced HMA are less than the minimum requirements for HMA mix design, determine the plasticity index of the aggregate blend under California Test 204.

If the plasticity index is greater than 10, do not use that aggregate blend.

If the plasticity index is from 4 to 10, treat the aggregate with dry lime with marination or lime slurry with marination.

If the plasticity index is less than 4, treat the aggregate with dry lime or lime slurry with marination, or treat the HMA with liquid antistrip.

39-1.02B(3) Warm Mix Asphalt Technology

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For HMA with warm mix asphalt additive technology, produce HMA mix samples for your mix design using your methodology for inclusion of warm mix asphalt admixture in laboratory-produced HMA. Cure the samples in a forced-air draft oven at 275 degrees F for 4 hours ± 10 minutes.

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For warm mix asphalt water injection foam technology, the use of foamed asphalt for mix design is not required.

39-1.02C Asphalt Binder

Asphalt binder must comply with section 92.

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For hot mix asphalt (leveling) the grade of asphalt binder for the HMA must be PG 64-10 or PG 64-16.

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39-1.02D Aggregate

39-1.02D(1) General

Aggregate must be clean and free from deleterious substances.

The aggregate for hot mix asphalt (leveling) must comply with the gradation specifications for Type A HMA in section 39-2.02.

39-1.02D(2) Aggregate Gradations

10-30-15

Aggregate gradation must be determined before the addition of asphalt binder and must include supplemental fine aggregates. Test for aggregate gradation under AASHTO T 27. Do not wash the coarse aggregate. Wash the fine aggregate only. Use a mechanical sieve shaker. Aggregate shaking time must not exceed 10 minutes for each coarse and fine aggregate portion.

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Choose a target value within the target value limits shown in the tables titled "Aggregate Gradations."

Gradations are based on nominal maximum aggregate size.

39-1.02D(3) Aggregate Lime Treatments

39-1.02D(3)(a) General

If aggregate lime treatment is required, virgin aggregate must comply with the aggregate quality specifications.

Lime for treating aggregate must comply with section 24-2.02B.

Water for lime treatment of aggregate with lime slurry must comply with section 24-2.02C.

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Do not treat RAP.

The lime ratio is the pounds of dry lime per 100 lb of dry virgin aggregate expressed as a percentage. Water content of slurry or untreated aggregate must not affect the lime ratio.

Coarse and fine aggregate fractions must have the lime ratio ranges shown in the following table:

Aggregate fractions	Lime ratio percent
Coarse	0.4–1.0
Fine	1.5–2.0
Combined	0.8–1.5

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the authorized lime ratio when you combine the individual aggregate sizes in the JMF proportions. The lime ratio must be determined before the addition of RAP.

If marination is required, marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

Treated aggregate must not have lime balls or clods.

39-1.02D(3)(b) Dry Lime

If marination is required:

1. Treat and marinate coarse and fine aggregates separately
2. Treat the aggregate and stockpile for marination only once
3. Treat the aggregate separate from HMA production

Proportion dry lime by weight with an automatic continuous proportioning system.

If you use a batch-type proportioning system for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment system for HMA batch mixing including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing plant for HMA production without lime marinated aggregates, use a controller that measures the blended aggregate weight after any additional water is added to the mixture. The controller must determine the quantity of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for lime treatment in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with Department's *MPQP* manual.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water to the aggregate for mixing and coating before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from the aggregate.

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from the aggregate. Store dry lime in a uniform and free-flowing condition. Introduce dry lime to the pugmill in a continuous process. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment process is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

39-1.02D(3)(c) Lime Slurry

For lime slurry aggregate treatment, treat aggregate separate from HMA production. Stockpile and marinate the aggregate.

Proportion lime and water with a continuous or batch mixing system.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to from 2 to 3 parts water by weight. The slurry must completely coat the aggregate.

Immediately before mixing lime slurry with the aggregate, water must not visibly separate from the aggregate.

Proportion lime slurry and aggregate by weight in a continuous process.

39-1.02E Liquid Antistrip Treatment

Liquid antistrip must be from 0.25 to 1.0 percent by weight of asphalt binder. Do not use liquid antistrip as a substitute for asphalt binder.

Liquid antistrip total amine value must be 325 minimum when tested under ASTM D2074.

Use only 1 liquid antistrip type or brand at a time. Do not mix liquid antistrip types or brands.

Store and mix liquid antistrip under the manufacturer's instructions.

39-1.02F–39-1.02G Reserved

39-1.02H Hot Mix Asphalt Production

39-1.02H(1) General

Do not start HMA production before verification and authorization of JMF.

HMA plants must be Department-qualified. Before production, the HMA plant must have a current qualification under the Department's Material Plant Quality Program.

Weighing and metering devices used for the production of HMA modified with additives must comply with the requirements of the Department's *MPQP*. If a loss-in-weight meter is used for dry HMA additive, the meter must have an automatic and integral material delivery control system for the refill cycle.

Calibrate the loss-in-weight meter by:

1. Including at least 1 complete system refill cycle during each calibration test run
2. Operating the device in a normal run mode for 10 minutes immediately before starting the calibration process
3. Isolating the scale system within the loss-in-weight feeder from surrounding vibration
4. Checking the scale system within the loss-in-weight feeder for accuracy before and after the calibration process and daily during mix production
5. Using a 15-minute or 250-pound-minimum test run size for a dry ingredient delivery rate of less than 1 ton per hour.
6. Complying with the limits of Table B, "Conveyor Scale Testing Extremes," in the Department's *MPQP*

Proportion aggregate by hot or cold-feed control.

Aggregate temperature must not be more than 375 degrees F when mixed with the asphalt binder.

Asphalt binder temperature must be from 275 to 375 degrees F when mixed with aggregate.

Mix HMA ingredients into a homogeneous mixture of coated aggregates.

HMA with or without RAP must not be more than 325 degrees F.

For HMA produced using warm mix asphalt technology, HMA must be at a temperature between 240 and 325 degrees F.

If method compaction is used, HMA must be produced at a temperature between 305 and 325 degrees F.

If you stop production for longer than 30 days, a production start-up evaluation is required.

39-1.02H(2) Liquid Antistrip

If 3 consecutive sets of recorded production data show actual delivered liquid antistrip weight is more than ±1 percent of the authorized mix design liquid antistrip weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered liquid antistrip weight is more than ±2 percent of the authorized mix design liquid antistrip weight, stop production. If the liquid antistrip weight exceeds 1.2 percent of the asphalt binder weight, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the quantity produced 5 minutes before and 5 minutes after the capture time. For the duration of the Contract, collected data must be stored by the plant controller or a computer's memory at the plant.

The Engineer orders proportioning activities stopped for any of the following:

1. You do not submit data
2. You submit incomplete, untimely, or incorrectly formatted data
3. You do not take corrective actions
4. You take late or unsuccessful corrective actions
5. You do not stop production when proportioning tolerances are exceeded
6. You use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

39-1.02H(3) Warm Mix Asphalt Technology

Proportion all ingredients by weight. The HMA plant process controller must be the sole source of ingredient proportioning control and be fully interfaced with all scales and meters used in the production process. The addition of the HMA additive must be controlled by the plant process controller.

Liquid ingredient additive, including a normally dry ingredient made liquid, must be proportioned with a mass flow meter at continuous mixing plants. Use a mass flow meter or a container scale to proportion liquid additives at batch mixing plants.

Continuous mixing plants using HMA additives must comply with the following:

1. Dry ingredient additives for continuous production must be proportioned with a conveyor scale or a loss-in-weight meter.
2. HMA plant process controller and ingredient measuring systems must be capable of varying all ingredient feed rates proportionate with the dry aggregate delivery at all production rates and rate changes.
3. Liquid HMA additive must enter the production stream with the binder. Dry HMA additive must enter the production stream at or before the mixing area.

4. If dry HMA additives are used at continuous mixing HMA plants, baghouse dust systems must return all captured material to the mix. This requirement is waived for lime-treated aggregates.

5. HMA additive must be proportioned to within ±0.3 percent of the target additive rate.

Batch mixing plants using HMA additives must comply with the following:

1. Metered HMA additive must be placed in an intermediate holding vessel before being added to the stream of asphalt binder as it enters the pugmill.
2. If a container scale is used, weigh additive before combining with asphalt binder. Keep the container scale separate from other ingredient proportioning. The container scale capacity must be no more than twice the volume of the maximum additive batch size. The container scale's graduations must be smaller than the proportioning tolerance or 0.001 times the container scale capacity.
3. Dry HMA additive proportioning devices must be separate from metering devices for the aggregates and asphalt binder. Proportion dry HMA additive directly into the pugmill or place in an intermediate holding vessel to be added to the pugmill at the appropriate time in the batch cycle. Dry ingredients for batch production must be proportioned with a hopper scale.
4. Zero tolerance for the HMA additive batch scale is ±0.5 percent of the target additive weight. The indicated HMA additive batch scale weight may vary from the preselected weight setting by up to ±1.0 percent of the target additive weight.

39-1.02I Geosynthetic Pavement Interlayer

Geosynthetic pavement interlayer must comply with the specifications for pavement fabric, paving mat, paving grid, paving geocomposite grid, or geocomposite strip membrane as shown.

The asphalt binder for geosynthetic pavement interlayer must be PG 64-10, PG 64-16, or PG 70-10.

39-1.02J Tack Coat

Tack coat must comply with the specifications for asphaltic emulsion or asphalt binder. Choose the type and grade.

39-1.02K Miscellaneous Areas and Dikes

For miscellaneous areas and dikes:

1. Choose either the 3/8-inch, or 1/2-inch aggregate gradation for Type A HMA.

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2. Minimum asphalt binder content must be 6.40 percent for 3/8-inch aggregate and 5.70 percent for 1/2-inch aggregate. If you request and the Engineer authorizes, you may reduce the minimum asphalt binder content.

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3. Choose asphalt binder Grade PG 64-10, PG 64-16 or PG 70-10.

For HMA used in miscellaneous areas and dikes, sections 39-1.01C, 39-1.01D, 39-1.02B, 39-1.02D(3), and 39-1.02E–J do not apply.

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39-1.02L Replace Asphalt Concrete Surfacing

HMA to be used for replacing asphalt concrete surfacing must comply with Type A HMA as specified in section 39-2.

The grade of asphalt binder must be PG 64-10 or PG 64-16.

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39-1.03 CONSTRUCTION

39-1.03A General

Do not place HMA on wet pavement or frozen surface.

You may deposit HMA in a windrow and load it in the paver if:

1. Paver is equipped with a hopper that automatically feeds the screed
2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
3. Activities for deposit, pickup, loading, and paving are continuous
4. HMA temperature in the windrow does not fall below 260 degrees F

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HMA placed in a windrow on the roadway surface must not extend more than 250 feet in front of the loading equipment or material transfer vehicle.

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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

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 130 degrees F for HMA with warm mix asphalt technology

39-1.03B Spreading and Compacting Equipment

39-1.03B(1) General

Paving equipment for spreading must be:

1. Self-propelled
2. Mechanical
3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
4. Equipped with a full-width compacting device
5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

Install and maintain grade and slope references.

The screed must be heated and produce a uniform HMA surface texture without tearing, shoving, or gouging.

The paver must not leave marks such as ridges and indentations unless you can eliminate them by rolling.

Rollers must be equipped with a system that prevents HMA from sticking to the wheels. You may use a parting agent that does not damage the HMA or impede the bonding of layers.

In areas inaccessible to spreading and compacting equipment:

1. Spread the HMA by any means to obtain the specified lines, grades, and cross sections
2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction

39-1.03B(2) Material Transfer Vehicle

If a material transfer vehicle is specified, the material transfer vehicle must have sufficient capacity to prevent stopping the paver and must be capable of:

1. Either receiving HMA directly from trucks or using a windrow pickup head to load it from a windrow deposited on the roadway surface
2. Remixing the HMA with augers before transferring into the paver's receiving hopper or feed system
3. Transferring HMA directly into the paver's receiving hopper or feed system

39-1.03B(3) Method Compaction Equipment

For method compaction, each paver spreading HMA must be followed by 3 rollers:

1. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2,500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static weight must be at least 7.5 tons.
2. One oscillating type pneumatic-tired roller at least 4 feet wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 60 psi minimum and maintained so that the air pressure does not vary more than 5 psi.
3. One steel-tired, 2-axle tandem roller. The roller's gross static weight must be at least 7.5 tons.

Each roller must have a separate operator. Rollers must be self-propelled and reversible.

39-1.03B(4)–39-1.03B(6) Reserved

39-1.03C Surface Preparation

39-1.03C(1) General

Before placing HMA, remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.

39-1.03C(2) Subgrade

Prepare subgrade to receive HMA under the sections for the material involved. Subgrade must be free of loose and extraneous material.

39-1.03C(3) Reserved

39-1.03C(4) Prepaving Inertial Profiler

Section 39-1.03C(4) applies to existing asphalt concrete surfaces receiving an HMA overlay if a bid item for prepaving inertial profiler is shown in the Bid Item List.

Before starting paving activities, perform prepaving inertial profiler measurements. Prepaving inertial profiler includes taking profiles of the existing pavement, analyzing the data with ProVAL to determine existing pavement International Roughness Index, Mean Roughness Index, and areas of localized roughness.

If the Contract includes cold planing, perform prepaving inertial profiler measurements before cold planning.

If the Contract includes replace asphalt concrete surfacing, perform prepaving inertial profiler measurements after replacing the asphalt concrete surfacing.

39-1.03C(5) Prepaving Grinding

Section 39-1.03C(5) applies to all existing asphalt concrete surfaces that will not be cold planned or milled and that will receive an HMA overlay less than or equal to 0.20 foot exclusive of OGFC if a bid item for prepaving grinding day is shown in the Bid Item List.

After performing prepaving inertial profiling, correct areas of localized roughness greater than 180 in/mi.

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Notify the Engineer of those areas of localized roughness that cannot be corrected by prepaving grinding according to the ProVAL smoothness assurance analysis grinding report. The Engineer responds to your notification within 5 business days.

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For those areas of localized roughness that cannot be corrected by grinding, the Engineer may order you to either (1) not correct the areas of localized roughness or (2) correct areas of localized roughness by a different method and take profiles of the corrected areas with an inertial profiler. Corrective work performed by a different method, including taking profiles of the corrected areas and associated traffic control, is change order work.

If ordered not to correct areas of localized roughness, the smoothness specifications do not apply to the final pavement surface placed in those areas.

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After correcting prepaving areas of localized roughness, take profiles of the corrected area and submit profile data as specified in section 39-1.01C(13)(d).

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Dispose of grinding residue.

Pave within 7 days of correcting areas.

The final pavement surface must comply with section 39-1.01D(9)(c).

If the Engineer determines more time is required for prepaving grinding than the Contract allows for and if prepaving grinding is a controlling activity, the Engineer makes a time adjustment.

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39-1.03C(6) Tack Coat

Apply tack coat:

1. To existing pavement including planed surfaces
2. Between HMA layers
3. To vertical surfaces of:
   3.1. Curbs
   3.2. Gutters
   3.3. Construction joints

Before placing HMA, apply tack coat in 1 application at the minimum residual rate shown in the following table for the condition of the underlying surface:

Tack Coat Application Rates for HMA

HMA over:	Minimum Residual Rates (gal/sq yd)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA (between layers)	0.02	0.03	0.02
PCC and existing AC surfacing	0.03	0.04	0.03
Planed pavement	0.05	0.06	0.04

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If a stress absorbing membrane interlayer as specified in section 37-2.06 is applied, the tack coat application rates for new HMA apply.

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Notify the Engineer if you dilute asphaltic emulsion with water. The weight ratio of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water either by weight or volume under section 9-1.02 or you may use water meters from water districts, cities, or counties. If you measure water by volume, apply a conversion factor to determine the correct weight.

With each dilution, submit:

1. Weight ratio of water to bituminous material in the original asphaltic emulsion
2. Weight of asphaltic emulsion before diluting
3. Weight of added water
4. Final dilution weight ratio of water to asphaltic emulsion

Apply to vertical surfaces with a residual tack coat rate that will thoroughly coat the vertical face without running off.

If you request and the Engineer authorizes, you may:

1. Change tack coat rates
2. Omit tack coat between layers of new HMA during the same work shift if:
   2.1. No dust, dirt, or extraneous material is present
   2.2. Surface is at least 140 degrees F

Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.

Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.

Asphalt binder tack coat temperature must be from 285 to 350 degrees F when applied.

39-1.03C(7) Geosynthetic Pavement Interlayer

If specified, place geosynthetic pavement interlayer over a coat of asphalt binder. Place geosynthetic pavement interlayer in compliance with the manufacturer's instructions.

Before placing the geosynthetic pavement interlayer and asphalt binder:

1. Repair cracks 1/4 inch and wider, spalls, and holes in the pavement. Repairing cracks is change order work.
2. Clean the pavement of loose and extraneous material.

Immediately before placing the interlayer, apply 0.25 ± 0.03 gallon of asphalt binder per square yard of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 3 inches on each side. At an interlayer overlap, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.

Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than 1/2 inch thick. If the overlapping wrinkle is more than 1/2 inch thick, cut the wrinkle out and overlap the interlayer no more than 2 inches.

The minimum HMA thickness over the interlayer must be 0.12 foot thick including conform tapers. Do not place the interlayer on a wet or frozen surface.

Overlap the interlayer borders between 2 to 4 inches. In the direction of paving, overlap the following roll with the preceding roll at any break.

You may use rolling equipment to correct distortions or wrinkles in the interlayer.

If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.

Before placing HMA on the interlayer, do not expose the interlayer to:

1. Traffic except for crossings under traffic control and only after you place a small HMA quantity
2. Sharp turns from construction equipment
3. Damaging elements

Pave HMA on the interlayer during the same work shift.

39-1.03D Longitudinal Joints

39-1.03D(1) General

Longitudinal joints in the top layer must match lane lines. Alternate the longitudinal joint offsets in the lower layers at least 0.5 foot from each side of the lane line. You may request other longitudinal joint placement patterns.

A vertical longitudinal joint of more than 0.15 foot is not allowed at any time between adjacent lanes open to traffic.

For HMA thickness of 0.15 foot 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 foot, you must place HMA on adjacent traveled way lanes or shoulder 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 other authorized release agent under the conform tapers to facilitate the taper removal when paving activities resume.

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material.

39-1.03D(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.

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39-1.03E Pavement Edge Treatments

Construct edge treatment on the HMA pavement as shown.

Where a tapered edge is required, use the same type of HMA used for the adjacent lane or shoulder.

The edge of roadway where the tapered edge is to be placed must have a solid base, free of debris such as loose material, grass, weeds, or mud. Grade the areas to receive the tapered edge as required.

The tapered edge must be placed monolithic with the adjacent lane or shoulder and must be shaped and compacted with a device attached to the paver.

The device must be capable of shaping and compacting HMA to the required cross section as shown. Compaction must be accomplished by constraining the HMA to reduce the cross sectional area by 10 to 15 percent. The device must produce a uniform surface texture without tearing, shoving, or gouging and must not leave marks such as ridges and indentations. The device must be capable of transitioning to cross roads, driveways, and obstructions.

For the tapered edge, 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.

If paving is done in multiple lifts, the tapered edge must be placed with each lift.

Short sections of hand work are allowed to construct tapered edge transitions.

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39-1.03F 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.

39-1.03G 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.

If shoulders or median borders are shown, pave shoulders and median borders adjacent to the lane before opening a lane to traffic.

If shoulder conform tapers are shown, place conform tapers concurrently with the adjacent lane's paving.

If a driveway or a road connection is shown, place additional HMA along the pavement's edge to conform to road connections and driveways. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper.

39-1.03H Leveling

Section 39-1.03H applies if a bid item for hot mix asphalt (leveling) is shown on the Bid Item List.

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 hot mix asphalt (leveling).

39-1.03I Miscellaneous Areas and Dikes

Prepare the area to receive HMA for miscellaneous areas and dikes, including excavation and backfill as needed.

Spread miscellaneous areas in 1 layer and compact to the specified lines and grades.

In median areas adjacent to slotted median drains, each layer of HMA must not exceed 0.20 foot maximum compacted thickness.

The finished surface must be:

1. Textured uniformly
2. Compacted firmly
3. Without depressions, humps, and irregularities

39-1.03J Replace Asphalt Concrete Surfacing

Where replace asphalt concrete surfacing is shown, remove existing asphalt concrete surfacing and replace with HMA. The Engineer determines the exact limits of asphalt concrete surfacing to be replaced.

Replace asphalt concrete in a lane before the lane is specified to be opened to traffic.

Before removing asphalt concrete, outline the replacement area and cut neat lines with a saw or grind to full depth of the existing asphalt concrete. Do not damage asphalt concrete and base remaining in place.

If the base is excavated beyond the specified plane, replace it with HMA. The Department does not pay for this HMA.

Do not use a material transfer vehicle if replace asphalt concrete surfacing is specified.

39-1.03K–39-1.03N Reserved

39-1.03O Compaction

39-1.03O(1) General

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving.

If a vibratory roller is used as a finish roller, turn the vibrator off.

10-30-15

Do not open new HMA pavement to traffic until its mid depth temperature is below 160 degrees F.

04-18-14

If the surface to be paved is both in sunlight and shade, pavement surface temperatures are taken in the shade.

39-1.03O(2) Method Compaction

Use method compaction for any of the following conditions:

10-17-14

1. HMA pavement thickness shown is less than 0.15 foot
2. Replace asphalt concrete surfacing
3. Leveling courses
4. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

04-18-14

HMA compaction coverage is the number of passes needed to cover the paving width. A pass is 1 roller's movement parallel to the paving in either direction. Overlapping passes are part of the coverage being made and are not a subsequent coverage. Do not start a coverage until completing the prior coverage.

Method compaction must consist of performing:

1. Breakdown compaction of each layer with 3 coverages using a vibratory roller. The speed of the vibratory roller in miles per hour must not exceed the vibrations per minute divided by 1,000. If the HMA layer thickness is less than 0.08 foot, turn the vibrator off.
2. Intermediate compaction of each layer of HMA with 3 coverages using a pneumatic-tired roller at a speed not to exceed 5 mph.
3. Finish compaction of HMA with 1 coverage using a steel-tired roller.

Start rolling at the lower edge and progress toward the highest part.

The Engineer may order fewer coverages if the layer thickness of HMA is less than 0.15 foot.

39-1.03O(3)–39-1.03O(5) Reserved

39-1.03P Smoothness Corrections

10-30-15

If the pavement surface does not comply with section 39-1.01D(9)(c), grind the pavement to within specified tolerances, remove and replace the pavement, or place an overlay of HMA. Do not start corrective work until your method is authorized.

Do not use equipment with carbide cutting teeth to grind the pavement unless authorized.

Smoothness corrections must leave at least 75 percent of the specified HMA thickness. If ordered, core the pavement at the locations determined by the Engineer. Coring, including traffic control, is change order work. Remove and replace deficient pavement areas where the overlay thickness is less than 75 percent of the thickness specified as determined by the Engineer.

04-18-14

Corrected HMA pavement areas must be uniform rectangles with edges:

1. Parallel to the nearest HMA pavement edge or lane line
2. Perpendicular to the pavement centerline

On ground areas not to be overlaid with OGFC, apply fog seal coat under section 37-2.

Where corrections are made within areas requiring testing with inertial profiler, reprofile the entire lane length with the inertial profiler device.

Where corrections are made within areas requiring testing with a 12-foot straightedge, retest the corrected area with the straightedge.

39-1.03Q Data Cores

Section 39-1.03Q applies if a bid item for data core is shown on the Bid Item List.

Take data cores of the completed HMA pavement, underlying base, and subbase material. Notify the Engineer 3 business days before coring.

Protect data cores and surrounding pavement from damage.

Take 4-inch or 6-inch diameter data cores:

1. At the beginning, end, and every 1/2 mile within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

Where data core samples are taken, backfill and compact the holes with authorized material.

After data core summary and photograph submittal, dispose of cores.

39-1.04 PAYMENT

10-30-15

The payment quantity for geosynthetic pavement interlayer is the area measured from the actual pavement area covered.

Except for tack coat used in minor HMA, payment for tack coat is not included in the payment quantity for hot mix asphalt.

If tack coat, asphalt binder, and asphaltic emulsion are paid as separate bid items, their bid items are measured under section 92 or section 94.

The Department does not adjust the unit price for an increase or decrease in the tack coat quantity.

The payment quantity for HMA of the type shown on the Bid Item List is measured based on the combined mixture weight. If recorded batch weights are printed automatically, the bid item for HMA is measured by using the printed batch weights, provided:

1. Total aggregate and supplemental fine aggregate weight per batch is printed. If supplemental fine aggregate is weighed cumulatively with the aggregate, the total aggregate batch weight must include the supplemental fine aggregate weight.
2. Total virgin asphalt binder weight per batch is printed.
3. Each truckload's zero tolerance weight is printed before weighing the first batch and after weighing the last batch.
4. Time, date, mix number, load number and truck identification is correlated with a load slip.
5. Copy of the recorded batch weights is certified by a licensed weigh master and submitted.

The payment quantity for place hot mix asphalt dike of the type shown on the Bid Item List is the length measured from end to end. Payment for the HMA used to construct the dike is not included in the payment for place hot mix asphalt dike.

The payment quantity for place hot mix asphalt (miscellaneous areas) is the area measured for the in-place compacted area. Payment for the HMA used for miscellaneous areas is not included in the payment for place hot mix asphalt (miscellaneous areas).

The payment quantity for replace asphalt concrete is the volume measured based on the specified dimensions and any adjustments ordered.

The Department does not adjust the unit price for an increase or decrease in the prepaving grinding day quantity.

04-18-14

39-2 TYPE A HOT MIX ASPHALT

39-2.01 GENERAL

39-2.01A Summary

Section 39-2 includes specifications for producing and placing Type A hot mix asphalt.

You may produce Type A HMA using an authorized warm mix asphalt technology.

39-2.01B Definitions

Reserved

39-2.01C Submittals

39-2.01C(1) General

Reserved

39-2.01C(2) Job Mix Formula

01-15-16

The JMF must be based on superpave HMA mix design as described in *MS-2 Asphalt Mix Design Methods* by the Asphalt Institute.

39-2.01C(3) Reclaimed Asphalt Pavement

Submit QC test results for RAP gradation with the combined aggregate gradation within 2 business days of taking RAP samples during HMA production.

39-2.01C(4)–39-2.01C(6) Reserved

39-2.01D Quality Control and Assurance

39-2.01D(1) General

Reserved

39-2.01D(2) Quality Control

39-2.01D(2)(a) General

Reserved

39-2.01D(2)(b) Aggregate

Test the quality characteristics of aggregate under the test methods and frequencies shown in the following table:

10-30-15

Aggregate Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Gradation[a]	AASHTO T 27	1 per 750 tons and any remaining part
Sand equivalent[b, c]	AASHTO T 176	
Moisture content[d]	AASHTO T 255	
Crushed particles	AASHTO T 335	1 per 10,000 tons or 2 per project whichever is greater
Los Angeles rattler	AASHTO T 96	
Flat and elongated particles	ASTM D4791	
Fine aggregate angularity	AASHTO T 304 Method A	

[a]If RAP is used, test the combined aggregate gradation under California Test 384.
[b]Reported value must be the average of 3 tests from a single sample.
[c]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[d]Test at continuous mixing plants only. If RAP is used, test the RAP moisture content at continuous mixing plant and batch mixing plant.

04-18-14

For lime treated aggregate, test aggregate before treatment and test for gradation and moisture content during HMA production.

39-2.01D(2)(c) Reclaimed Asphalt Pavement

10-17-14

Sample and test processed RAP at a minimum frequency of 1 sample per 1000 tons with a minimum of 6 samples per fractionated stockpile. If the fractionated stockpile has not been augmented, the 3 RAP samples taken and tested for mix design may be part of this minimum sample requirement. If a fractionated RAP stockpile is augmented, sample and test processed RAP quality characteristics at a minimum frequency of 1 sample per 500 tons of augmented RAP.

04-18-14

The combined RAP sample when tested under AASHTO T 164 must be within ±2.00 percent of the average asphalt binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form. If new fractionated RAP stockpiles are required, the average binder content of the new fractionated RAP stockpile must be within ±2.00 percent of the average binder reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

The combined RAP sample when tested under AASHTO T 209 must be within ±0.06 of the average maximum specific gravity reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

During Type A HMA production, sample RAP twice daily and perform QC testing for:

1. Aggregate gradation at least once a day under California Test 384
2. Moisture content at least twice a day

39-2.01D(2)(d) Type A Hot Mix Asphalt Production

01-15-16

Test the quality characteristics of Type A HMA under the test methods and frequencies shown in the following table:

Type A HMA Production Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Asphalt binder content	AASHTO T 308 Method A	1 per 750 tons and any remaining part
HMA moisture content	AASHTO T 329	1 per 2,500 tons but not less than 1 per paving day
Air voids content	AASHTO T 269	1 per 4,000 tons or 2 every 5 paving days, whichever is greater
Voids in mineral aggregate	MS-2 Asphalt Mixture Volumetrics	1 per 10,000 tons or 2 per project whichever is greater
Dust proportion	MS-2 Asphalt Mixture Volumetrics	
Density of core	California Test 375	2 per paving day
Nuclear gauge density	California Test 375	3 per 250 tons or 3 per paving day, whichever is greater
Hamburg wheel track	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project, whichever is greater
Moisture susceptibility	AASHTO T 283	

39-2.01D(3)–39-2.01D(4) Reserved

39-2.01D(5) Department Acceptance

The Department accepts Type A HMA based on compliance with:

1. Aggregate quality requirements shown in the following table:

10-30-15

Aggregate Quality

Quality characteristic	Test method	Requirement
Aggregate gradation[a]	AASHTO T 27	JMF ± Tolerance
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	AASHTO T 335	 95 90 70
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Sand equivalent (min.)[b, c]	AASHTO T 176	47
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	10
Fine aggregate angularity (min, %)[d]	AASHTO T 304 Method A	45

[a]The Engineer determines combined aggregate gradations containing RAP under California Test 384.
[b]Reported value must be the average of 3 tests from a single sample.
[c]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[d] 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.

04-18-14

2. If RAP is used, RAP quality requirements shown in the following table:

Reclaimed Asphalt Pavement Quality

Quality characteristic	Test method	Requirement
Binder content (% within the average value reported)	AASHTO T 164	±2.00
Specific gravity (within the average value reported)	AASHTO T 209	±0.06

3. In-place Type A HMA quality requirements shown in the following table:

Type A HMA Acceptance In Place

Quality characteristic	Test method	Requirement
Asphalt binder content (%)	AASHTO T 308 Method A	JMF -0.30, +0.50
HMA moisture content (max, %)	AASHTO T 329	1.00
Air voids content at N_{design} (%)[a, b]	AASHTO T 269	4.0 ± 1.5 (5.0 ± 1.5 for 1-inch aggregate)
Voids in mineral aggregate on laboratory-produced HMA (min, %)[a] Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS[g] = 1-inch with NMAS[g] = 3/4-inch	MS-2 Asphalt Mixture Volumetrics[c]	 16.5–19.5 15.5–18.5 14.5–17.5 13.5–16.5 13.5–16.5 14.5–17.5
Voids in mineral aggregate on plant-produced HMA (min, %)[a] Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS[g] = 1-inch with NMAS[g] = 3/4-inch	MS-2 Asphalt Mixture Volumetrics[c]	 15.5–18.5 14.5–17.5 13.5–16.5 12.5–15.5 12.5–15.5 13.5–16.5
Dust proportion	MS-2 Asphalt Mixture Volumetrics	0.6–1.3[h]
Density of core (% of max theoretical density)[e, f]	California Test 375	91.0–97.0
Hamburg wheel track (min number of passes at 0.5-inch rut depth) Binder grade: PG 58 PG 64 PG 70 PG 76 or higher	AASHTO T 324 (Modified)	 10,000 15,000 20,000 25,000
Hamburg wheel track (min number of passes at inflection point) Binder grade: PG 58 PG 64 PG 70 PG 76 or higher	AASHTO T 324 (Modified)	 10,000 10,000 12,500 15,000
Moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
Moisture susceptibility (min, psi, wet strength)	AASHTO T 283	70

[a]Prepare 3 briquettes. Report the average of 3 tests.
[b]The Engineer determines the bulk specific gravity of each lab-compacted briquette under AASHTO T 275, Method A, and theoretical maximum specific gravity under AASHTO T 209, Method A.
[c]Determine bulk specific gravity under AASHTO T 275, Method A.
[d]The Engineer determines the laboratory-prepared HMA value for mix design verification only.
[e]The Engineer determines percent of theoretical maximum density under California Test 375 except the Engineer uses:

1. AASHTO T 275 to determine in-place density of each density core
2. AASHTO T 209, Method A to determine theoretical maximum density instead of calculating

test maximum density

[f]The Engineer determines theoretical maximum density under AASHTO T 209, Method A, at the frequency specified in California Test 375, Part 5D.

[g]NMAS means nominal maximum aggregate size.

[h]For treated aggregate, the dust proportion requirement is 0.6–1.5.

04-18-14

39-2.02 MATERIALS

39-2.02A General

Reserved

39-2.02B Mix Design

01-15-16

The mix design for Type A HMA must comply with the requirements shown in the following table:

Type A HMA Mix Design Requirements

Quality characteristic	Test method	Requirement
Air voids content (%)	AASHTO T 269[a]	$N_{initial}$ > 8.0 N_{design} = 4.0 (N_{design} = 5.0 for 1-inch aggregate) N_{max} > 2.0
Gyration compaction (no. of gyrations)	AASHTO T 312	$N_{initial}$ = 8 N_{design} = 85.0 N_{max} = 130
Voids in mineral aggregate (min, %)[b] Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS[e] = 1-inch with NMAS[e] = 3/4-inch	MS-2 Asphalt Mixture Volumetrics	 16.5–19.5 15.5–18.5 14.5–17.5 13.5–16.5 13.5–16.5 14.5–17.5
Dust proportion	MS-2 Asphalt Mixture Volumetrics	0.6–1.3
Hamburg wheel track (min number of passes at 0.5-inch rut depth) Binder grade: PG 58 PG 64 PG 70 PG 76 or higher	AASHTO T 324 (Modified)[c]	 10,000 15,000 20,000 25,000
Hamburg wheel track (min number of passes at the inflection point) Binder grade: PG 58 PG 64 PG 70 PG 76 or higher	AASHTO T 324 (Modified)[c]	 10,000 10,000 12,500 15,000
Moisture susceptibility, dry strength (min, psi)	AASHTO T 283[c]	100
Moisture susceptibility, wet strength (min, psi)	AASHTO T 283[c, d]	70

[a]Calculate the air voids content of each specimen using AASHTO T 275, Method A, to determine bulk specific gravity. Use AASHTO T 209, Method A, to determine theoretical maximum specific gravity. Use a digital manometer and pycnometer when performing AASHTO T 209.
[b]Measure bulk specific gravity using AASHTO T 275, Method A.
[c]Test plant produced HMA.
[d]Freeze thaw required.
[e]NMAS means nominal maximum aggregate size.

10-30-15

For Type A HMA mixtures using RAP, the maximum allowed binder replacement is 25.0 percent in the upper 0.2 feet of HMA exclusive of OGFC and 40.0 percent below. Binder replacement is calculated as a percentage of the approved JMF target asphalt binder content.

04-18-14

For Type A HMA with a binder replacement percent less than or equal to 25 percent of your specified OBC, you may request that the performance graded asphalt binder grade with upper and lower temperature classifications be reduced by 6 degrees C from the specified grade.

For Type A HMA with a binder replacement greater than 25 percent of your specified OBC and less than or equal to 40 percent of OBC, you must use a performance graded asphalt binder grade with upper and lower temperature classifications reduced by 6 degrees C from the specified grade.

39-2.02C Asphalt Binder

Reserved

39-2.02D Aggregates

39-2.02D(1) General

Before the addition of asphalt binder and lime treatment, the aggregate must comply with the requirements shown in the following table:

10-30-15

Aggregate Quality

Quality characteristic	Test method	Requirement
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	AASHTO T 335	 95 90 70
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Sand equivalent (min)[a, b]	AASHTO T 176	47
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	10
Fine aggregate angularity (min, %)[c]	AASHTO T 304 Method A	45

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a Sand Reader Indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[c] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate, except if your JMF fails verification. Manufactured sand is fine aggregate produced by crushing rock or gravel.

04-18-14

39-2.02D(2) Aggregate Gradations

The aggregate gradations for Type A HMA must comply with the requirements shown in the following table:

Aggregate Gradation Requirements

Type A HMA pavement thickness shown	Gradation
0.10 foot	3/8 inch
Greater than 0.10 to less than 0.20 foot	1/2 inch
0.20 foot to less than 0.25 foot	3/4 inch
0.25 foot or greater	3/4 inch or 1 inch

Aggregate gradation must be within the target value limits for the specified sieve size shown in the following tables:

Aggregate Gradations for Type A HMA
(Percentage Passing)

1 inch

Sieve size	Target value limit	Allowable tolerance
1"	100	--
3/4"	88–93	TV ± 5
1/2"	72–85	TV ± 6
3/8"	55–70	TV ± 6
No. 4	35–52	TV ± 7
No. 8	22–40	TV ± 5
No. 30	8–24	TV ± 4
No. 50	5–18	TV ± 4
No. 200	3.0–7.0	TV ± 2.0

3/4 inch

Sieve size	Target value limit	Allowable tolerance
1"	100	--
3/4"	90–98	TV ± 5
1/2"	70–90	TV ± 6
No. 4	42–58	TV ± 5
No. 8	29–43	TV ± 5
No. 30	10–23	TV ± 4
No. 200	2.0–7.0	TV ± 2.0

1/2 inch

Sieve sizes	Target value limit	Allowable tolerance
3/4"	100	--
1/2"	95–98	TV ± 5
3/8"	72–95	TV ± 5
No. 4	52–69	TV ± 5
No. 8	35–55	TV ± 5
No. 30	15–30	TV ± 4
No. 200	2.0–8.0	TV ± 2.0

3/8 inch

Sieve sizes	Target value limits	Allowable tolerance
1/2"	100	--
3/8"	95–98	TV ± 5
No. 4	55–75	TV ± 5
No. 8	30–50	TV ± 5
No. 30	15–35	TV ± 5
No. 200	2.0–9.0	TV ± 2.0

No. 4

Sieve sizes	Target value limits	Allowable tolerance
3/8"	100	--
No. 4	95–98	TV ± 5
No. 8	70–80	TV ± 6
No. 30	34–45	TV ± 5
No. 200	2.0–12.0	TV ± 4.0

39-2.02E Reclaimed Asphalt Pavement

You may substitute RAP for part of the virgin aggregate in a quantity up to a maximum of 25 percent of the aggregate blend.

Provide enough space for meeting all RAP handling requirements at your facility. Provide a clean, graded base, well drained area for stockpiles.

If RAP is from multiple sources, blend the RAP thoroughly and completely before fractionating.

For RAP substitution greater than 15 percent of the aggregate blend, fractionate RAP stockpiles into 2 sizes, a coarse fraction RAP retained on 3/8-inch sieve, and a fine fraction RAP passing 3/8-inch sieve. For RAP substitution of 15 percent of the aggregate blend or less, fractionation is not required.

The RAP fractionation must comply with the requirements shown in the following table:

RAP Stockpile Fractionation Gradation Requirements

Quality characteristic	Test method	Requirement
Coarse (% passing the 1-inch sieve)	California Test 202[a]	100
Fine (% passing the 3/8-inch sieve)	California Test 202[a]	98–100

[a]Maximum mechanical shaking time is 10 minutes

You may use the coarse fractionated stockpile, the fine fractionated stockpile, or a combination of the coarse and fine fractionated stockpiles.

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.

39-2.02F Type A Hot Mix Asphalt Production

10-17-14

If RAP is used, the asphalt plant must automatically adjust the virgin asphalt binder to account for RAP percentage and RAP binder.

During production, you may adjust hot or cold-feed proportion controls for virgin aggregate and RAP. RAP must be within ±3 of RAP percentage shown in your Contractor Job Mix Formula Proposal form without exceeding 25 percent.

39-2.03 CONSTRUCTION

10-30-15

Where the pavement thickness shown is greater than 0.30 foot, you may place Type A HMA in multiple lifts not less than 0.15 foot each. If placing Type A HMA in multiple lifts:

1. Aggregate gradation must comply with the requirements shown in the following table:

Aggregate Gradation Requirements

Type A HMA lift thickness	Gradation
0.15 to less than 0.20 foot	1/2 inch
0.20 foot to less than 0.25 foot	3/4 inch
0.25 foot or greater	3/4 inch or 1 inch

2. Apply tack coat before placing a subsequent lift
3. The Engineer evaluates each HMA lift individually for compliance

Spread Type A HMA at the atmospheric and surface temperatures shown in the following table:

Minimum Atmospheric and Surface Temperatures for Type A HMA

Lift thickness, feet	Atmospheric,°F		Surface,°F	
	Unmodified asphalt binder	Modified asphalt binder	Unmodified asphalt binder	Modified asphalt binder
< 0.15	55	50	60	55
≥ 0.15	45	45	50	50

For method compaction, the maximum lift thickness must be 0.25 foot.

04-18-14

For Type A HMA placed under method compaction, if the asphalt binder is:

1. Unmodified, complete:
   1.1. 1st coverage of breakdown compaction before the surface temperature drops below 250 degrees F
   1.2. Breakdown and intermediate compaction before the surface temperature drops below 190 degrees F
   1.3. Finish compaction before the surface temperature drops below 150 degrees F
2. Modified, complete:
   2.1. 1st coverage of breakdown compaction before the surface temperature drops below 240 degrees F
   2.2. Breakdown and intermediate compaction before the surface temperature drops below 180 degrees F
   2.3. Finish compaction before the surface temperature drops below 140 degrees F

If you request and the Engineer authorizes, you may cool Type A HMA with water when rolling activities are complete. Apply water under section 17.

39-2.04 PAYMENT

Not Used

39-3 RUBBERIZED HOT MIX ASPHALT–GAP GRADED

39-3.01 GENERAL

39-3.01A Summary

Section 39-3 includes specifications for producing and placing rubberized hot mix asphalt–gap graded.

You may produce RHMA-G using a warm mix asphalt technology.

39-3.01B Definitions

Reserved

39-3.01C Submittals

39-3.01C(1) General

10-17-14

At least 5 business days before use, submit the permit issued by the local air district for asphalt rubber binder blending equipment. If an air quality permit is not required by the local air district for producing asphalt rubber binder, submit verification from the local air district that an air quality permit is not required.

At least 10 days before RHMA-G production, submit the name of an authorized laboratory to perform QC testing for asphalt rubber binder. The authorized laboratory must comply with the Caltrans Independent Assurance Program.

04-18-14

39-3.01C(2) Job Mix Formula

With your proposed JMF include MSDS for:

1. Base asphalt binder
2. CRM and asphalt modifier
3. Blended asphalt rubber binder components

01-15-16

The JMF must be based on superpave HMA mix design as described in *MS-2 Asphalt Mix Design Methods* by the Asphalt Institute.

39-3.01C(3) Asphalt Rubber Binder

Submit a proposal for asphalt rubber binder design and profile. In the design, include the asphalt binder, asphalt modifier, and CRM and their proportions.

If you change asphalt rubber binder supplier or any component material used in asphalt rubber binder or its percentage, submit a new JMF.

For the asphalt rubber binder used, submit:

1. Log of production daily.
2. Certificate of compliance with test results for CRM and asphalt modifier with each truckload delivered to the HMA plant. The certificate of compliance for asphalt modifier must represent no more than 5,000 lb.
3. Certified weight slips for the CRM and asphalt modifier furnished.

10-17-14

4. QC test results on viscosity within 2 business days after sampling.
5. QC test results on cone penetration, resilience, and softening point within 3 business days after sampling.

Submit a certificate of compliance for the CRM and asphalt modifier. With the certificate of compliance, submit test results for CRM and asphalt modifier with each truckload delivered to the HMA plant.

04-18-14

39-3.01D Quality Control and Assurance

39-3.01D(1) General

Reserved

39-3.01D(2) Job Mix Formula Verification

If you request, the Engineer verifies RHMA-G quality requirements within 7 days of receiving all verification samples and after the JMF document submittal has been accepted.

39-3.01D(3) Quality Control

39-3.01D(3)(a) General

Reserved

39-3.01D(3)(b) Asphalt Rubber Binder

39-3.01D(3)(b)(i) General

The asphalt rubber binder blending plant must be authorized under the Department's Material Plant Quality Program.

10-17-14

Take asphalt rubber binder samples from the feed line connecting the asphalt rubber binder tank to the HMA plant.

04-18-14

39-3.01D(3)(b)(ii) Asphalt Modifier

Test asphalt modifier under the test methods and frequencies shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Frequency
Viscosity	ASTM D445	1 per shipment
Flash point	ASTM D92	
Molecular Analysis		
Asphaltenes	ASTM D2007	1 per shipment
Aromatics	ASTM D2007	

39-3.01D(3)(b)(iii) Crumb Rubber Modifier

10-30-15

Sample and test scrap tire crumb rubber and high natural crumb rubber separately. Test CRM under the test methods and frequencies shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Frequency
Scrap tire crumb rubber gradation	California Test 385	1 per 10,000 lb
High natural crumb rubber gradation	California Test 385	1 per 3,400 lb
Wire in CRM	California Test 385	1 per 10,000 lb
Fabric in CRM	California Test 385	
CRM particle length	--	
CRM specific gravity	California Test 208	
Natural rubber content in high natural crumb rubber	ASTM D297	1 per 3,400 lb

39-3.01D(3)(b)(iv) Asphalt Rubber Binder

Test asphalt rubber binder under the test methods and frequencies shown in the following table:

Quality characteristic	Test method	Frequency
Cone penetration	ASTM D217	1 per lot[a]
Resilience	ASTM D5329	
Softening point	ASTM D36	
Viscosity	ASTM D7741	15 minutes before use per lot[a]

[a]The lot is defined in the Department's *MPQP*.

10-17-14

Retain the sample from each lot. Test for cone penetration, resilience, and softening point for the first 3 lots and, if all 3 lots pass, the testing frequency may be reduced to once for every 3 lots.

If QC test results indicate that the asphalt rubber binder does not meet the specifications, take corrective action and notify the Engineer.

04-18-14

39-3.01D(3)(c) Aggregate

Test the quality characteristics of aggregate under the test methods and frequencies shown in the following table:

10-30-15

Aggregate Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Gradation	AASHTO T 27	1 per 750 tons and any remaining part
Sand equivalent[a, b]	AASHTO T 176	
Moisture content[c]	AASHTO T 255	
Crushed particles	AASHTO T 335	1 per 10,000 tons or 2 per project, whichever is greater
Los Angeles rattler	AASHTO T 96	
Flat and elongated particles	ASTM D4791	
Fine aggregate angularity	AASHTO T 304 Method A	

[a]Reported value must be the average of 3 tests from a single sample.
bUse of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[c]Test at continuous mixing plants only

04-18-14

For lime treated aggregate, test aggregate before treatment and test for gradation and moisture content during RHMA-G production.

39-3.01D(3)(d) Rubberized Hot Mix Asphalt–Gap Graded Production

01-15-16

Test the quality characteristics of RHMA-G under the test methods and frequencies shown in the following table:

RHMA-G Production Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Asphalt binder content	AASHTO T 308 Method A	1 per 750 tons and any remaining part
HMA moisture content	AASHTO T 329	1 per 2,500 tons but not less than 1 per paving day
Air voids content	AASHTO T 269	1 per 4,000 tons or 2 every 5 paving days, whichever is greater
Voids in mineral aggregate	MS-2 Asphalt Mixture Volumetrics	1 per 10,000 tons or 2 per project whichever is greater
Dust proportion	MS-2 Asphalt Mixture Volumetrics	
Density of core	California Test 375	2 per paving day
Nuclear gauge density	California Test 375	3 per 250 tons or 3 per paving day, whichever is greater
Hamburg wheel track	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project, whichever is greater
Moisture susceptibility	AASHTO T 283	

39-3.01D(4) Reserved

39-3.01D(5) Department Acceptance

39-3.01D(5)(a) General

The Department accepts RHMA-G based on compliance with:

1. Aggregate quality requirements shown in the following table:

Aggregate Quality

Quality characteristic	Test method	Requirement
Aggregate gradation	AASHTO T 27	JMF ± Tolerance
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	AASHTO T 335	 -- 90 70
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Sand equivalent (min)[a, b]	AASHTO T 176	47
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	Report only
Fine aggregate angularity (min, %)[c]	AASHTO T 304 Method A	45

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a sand reading Indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[c]The Engineer waives this specification if RHMA-G contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

01-15-16

2. In-place RHMA-G quality requirements shown in the following table:

RHMA-G Acceptance In Place

Quality characteristic	Test method	Requirement
Asphalt binder content (%)	AASHTO T 308 Method A	JMF -0.40, +0.50
HMA moisture content (max, %)	AASHTO T 329	1.00
Air voids content @ N_{design} (%)[a, b]	AASHTO T 269	4.0 ± 1.5
Voids in mineral aggregate on laboratory-produced HMA[d] (min, %) Gradation: 1/2-inch and 3/4-inch	MS-2 Asphalt Mixture Volumetrics[c]	18.0–23.0
Voids in mineral aggregate on plant-produced HMA (min, %)[a] Gradation: 1/2-inch and 3/4-inch	MS-2 Asphalt Mixture Volumetrics[c]	18.0–23.0
Dust proportion[a]	MS-2 Asphalt Mixture Volumetrics	Report only
Density of core (% of max theoretical density)[e, f]	California Test 375	91.0–97.0
Hamburg wheel track (min number of passes at 0.5-inch rut depth) Binder grade: PG 58 PG 64 PG 70	AASHTO T 324 (Modified)	 15,000 20,000 25,000
Hamburg wheel track (min number of passes at inflection point) Binder grade: PG 58 PG 64 PG 70	AASHTO T 324 (Modified)	 10,000 12,500 15,000
Moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
Moisture susceptibility (min, psi, wet strength)	AASHTO T 283	70

[a]Prepare 3 briquettes. Report the average of 3 tests.
[b]The Engineer determines the bulk specific gravity of each lab-compacted briquette under AASHTO T 275, Method A, and theoretical maximum specific gravity under AASHTO T 209, Method A.
[c]Determine bulk specific gravity under AASHTO T 275, Method A.
[d]The Engineer determines the laboratory-prepared RHMA-G value for mix design verification only.
[e]The Engineer determines percent of theoretical maximum density under California Test 375 except the Engineer uses:

1. AASHTO T 275, Method A, to determine in-place density of each density core instead of using the nuclear gauge
2. AASHTO T 209, Method A to determine theoretical maximum density instead of calculating test maximum density.

[f]The Engineer determines theoretical maximum density under AASHTO T 209, Method A, at the frequency specified in California Test 375, Part 5D.

04-18-14

39-3.01D(5)(b) Asphalt Rubber Binder

39-3.01D(5)(b)(i) General

The Department does not use asphalt rubber binder design profile for production acceptance.

39-3.01D(5)(b)(ii) Asphalt Modifier

The Department accepts asphalt modifier based on compliance with the requirements shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Viscosity at 100 °C ($m^2/s \times 10^{-6}$)	ASTM D445	X ± 3[a]
Flash point (min, °C)	ASTM D92	207
Molecular Analysis		
Asphaltenes (max, % by mass (max)	ASTM D2007	0.1
Aromatics (min % by mass)	ASTM D2007	55

[a]The symbol "X" is the asphalt modifier viscosity.

39-3.01D(5)(b)(iii) Crumb Rubber Modifier

10-30-15

The Department accepts CRM, scrap tire crumb rubber, and high natural crumb rubber based on compliance with the requirements shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Scrap tire crumb rubber gradation (% passing No. 8 sieve)	California Test 385	100
High natural scrap tire crumb rubber gradation (% passing No. 10 sieve)	California Test 385	100
Wire in CRM (max, %)	California Test 385	0.01
Fabric in CRM (max, %)	California Test 385	0.05
CRM particle length (max, in)	--	3/16
CRM specific gravity	California Test 208	1.1–1.2
Natural rubber content in high natural crumb rubber (%)	ASTM D297	40.0–48.0

Scrap tire crumb rubber and high natural crumb rubber are sampled and tested separately.

39-3.01D(5)(b)(iv) Asphalt Rubber Binder

10-17-14

For Department acceptance testing, take samples in the Engineer's presence of asphalt rubber binder in 6 qt cans with open tops and friction lids. Take samples once per day or every 5 lots, whichever is greater.

The Department accepts asphalt rubber binder based on compliance with the requirements shown in the following table:

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–70
Resilience at 25 °C (min, % rebound)	ASTM D5329	18
Softening point (°C)	ASTM D36	52–74
Viscosity at 190 °C (centipoises)[a]	ASTM D7741	1,500–4,000

[a]Prepare sample for viscosity test under California Test 388.

04-18-14

39-3.01D(5)(c)–39-3.01D(5)(f) Reserved

39-3.02 MATERIALS

39-3.02A General

Reserved

39-3.02B Rubberized Hot Mix Asphalt–Gap Graded Mix Design

01-15-16

For RHMA-G, the mix design must comply with the requirements shown in the following table:

RHMA-G Mix Design Requirements

Quality characteristic	Test method	Requirement
Air voids content (%)	AASHTO T 269[a]	N_{design} = 4.0
Gyration compaction (no. of gyrations)	AASHTO T 312	N_{design} = 50–150[b]
Voids in mineral aggregate (min, %)	MS-2 Asphalt Mixture Volumetricsc	18.0–23.0
Dust proportion	MS-2 Asphalt Mixture Volumetrics	Report only
Hamburg wheel track (min number of passes at 0.5-inch rut depth) Binder grade: PG 58 PG 64 PG 70	AASHTO T 324 (Modified)[d]	 15,000 20,000 25,000
Hamburg wheel track (min number of passes at the inflection point) Binder grade: PG 58 PG 64 PG 70	AASHTO T 324 (Modified)[d]	 10,000 12,500 15,000
Moisture susceptibility, dry strength (min, psi)	AASHTO T 283[d]	100
Moisture susceptibility, wet strength (min, psi)	AASHTO T 283[d, e]	70

[a]Calculate the air voids content of each specimen using AASHTO T 275, Method A, to determine bulk specific gravity and AASHTO T 209, Method A, to determine theoretical maximum specific gravity. Under AASHTO T 209 use a digital manometer and pycnometer when performing AASHTO T 209.
[b]Superpave gyratory compactor ram pressure may be increased to a maximum of 825kPa, and specimens may be held at a constant height for a maximum of 90 minutes.
[c]Measure bulk specific gravity using AASHTO T 275, Method A.
[d]Test plant produced RHMA.
[e]Freeze thaw required.

Determine the amount of asphalt rubber binder to be mixed with the aggregate for RHMA-G as follows:

1. Base the calculations on the average of 3 briquettes produced at each asphalt rubber binder content.
2. Plot asphalt rubber binder content versus average air voids content for each set of 3 specimens and connect adjacent points with a best-fit curve.
3. Calculate voids in mineral aggregate for each specimen, average each set, and plot the average versus asphalt rubber binder content.
4. Calculate the dust proportion and plot versus asphalt rubber binder content.
5. From the curve plotted, select the theoretical asphalt rubber binder content at 4 percent air voids.
6. At the selected asphalt rubber binder content, calculate dust proportion.
7. Record the asphalt rubber binder content in the Contractor Hot Mix Asphalt Design Data Form as the OBC.

The OBC must not fall below 7.5 percent by total weight of the mix.

Laboratory mixing and compaction must comply with AASHTO R 35, except the mixing temperature of the aggregate must be between 300 and 325 degrees F. The mixing temperature of the asphalt rubber binder must be between 375 and 425 degrees F. The compaction temperature of the combined mixture must be between 290 and 320 degrees F.

39-3.02C Asphalt Rubber Binder

39-3.02C(1) General

Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. CRM

The combined asphalt binder and asphalt modifier must be 80.0 ± 2.0 percent by weight of the asphalt rubber binder.

39-3.02C(2) Asphalt Modifier

Asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon, and must comply with the requirements shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Viscosity at 100 °C ($m^2/s \times 10^{-6}$)	ASTM D445	X ± 3[a]
Flash point (min, °C)	ASTM D92	207
Molecular Analysis		
Asphaltenes (max, % by mass)	ASTM D2007	0.1
Aromatics (min, % by mass)	ASTM D2007	55

[a]The symbol "X" is the proposed asphalt modifier viscosity. "X" must be between 19 and 36. A change in "X" requires a new asphalt rubber binder design.

Asphalt modifier must be from 2.0 to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder.

39-3.02C(3) Crumb Rubber Modifier

10-30-15

CRM must be a ground or granulated combination of scrap tire crumb rubber and high natural scrap tire crumb rubber. CRM must be 75.0 ± 2.0 percent scrap tire crumb rubber and 25.0 ± 2.0 percent high natural scrap tire crumb rubber by total weight of CRM. Scrap tire crumb rubber and high natural scrap tire crumb rubber must be derived from waste tires described in Pub Res Code § 42703.

The CRM must comply with the requirements shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Scrap tire crumb rubber gradation (% passing No. 8 sieve)	California Test 385	100
High natural crumb rubber gradation (% passing No. 10 sieve)	California Test 385	100
Wire in CRM (max, %)	California Test 385	0.01
Fabric in CRM (max, %)	California Test 385	0.05
CRM particle length (max, in)[a]	--	3/16
CRM specific gravity	California Test 208	1.1–1.2
Natural rubber content in high natural crumb rubber (%)	ASTM D297	40.0–48.0

[a]Test at mix design and for certificate of compliance.

04-18-14

CRM must be ground or granulated at ambient temperature. If steel and fiber are cryogenically separated, separation must occur before grinding or granulating. Cryogenically produced CRM particles must be ground or granulated and not pass through the grinder or granulator.

CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. You may add calcium carbonate or talc up to 3 percent by weight of CRM.

39-3.02C(4) Design and Profile

Design the asphalt rubber binder from testing you perform for each quality characteristic and for the reaction temperatures expected during production. The profile must include the same component sources for the asphalt rubber binder used. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the tests shown in the following table:

Asphalt Rubber Binder Reaction Design Profile

Quality characteristic	Test Method	Minutes of reaction [a]							Limits
		45	60	90	120	240	360	1440	
Cone penetration at 25 °C (0.10 mm)	ASTM D217	X [b]				X		X	25–70
Resilience at 25 °C (min, % rebound)	ASTM D5329	X				X		X	18
Field softening point (°C)	ASTM D36	X				X		X	52–74
Viscosity (centipoises)	ASTM D7741	X	X	X	X	X	X	X	1,500–4,000

[a]Six hours (360 minutes) after CRM addition, reduce the oven temperature to 275 °F for 16 hours. After the 16-hour (960 minutes) cool down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1,440 minutes).
[b]"X" denotes required testing

39-3.02C(5) Asphalt Rubber Binder Production

39-3.02C(5)(a) General

10-30-15

Deliver scrap tire crumb rubber and high natural scrap tire crumb rubber in separate bags.

04-18-14

39-3.02C(5)(b) Mixing

Proportion and mix asphalt binder, asphalt modifier, and CRM simultaneously or premix the asphalt binder and asphalt modifier before adding CRM. If you premix asphalt binder and asphalt modifier, mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be from 375 to 440 degrees F.

After interacting for at least 45 minutes, the quality characteristics of asphalt rubber binder must comply with the requirements shown in the following table:

10-17-14

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–70
Resilience at 25 °C (min, % rebound)	ASTM D5329	18
Softening point (°C)	ASTM D36	52–74
Viscosity at 190 °C (centipoises)[a]	ASTM D7741	1,500–4,000

[a]Prepare sample for viscosity test under California Test 388.

04-18-14

Do not use asphalt rubber binder during the first 45 minutes of the reaction period. During this period, the asphalt rubber binder mixture must be between 375 degrees F and the lower of 425 or 25 degrees F below the asphalt binder's flash point indicated in the MSDS.

10-30-15

If any asphalt rubber binder is not used within 4 hours after the reaction period, discontinue heating. If the asphalt rubber binder drops below 375 degrees F, reheat before use. If you add more scrap tire crumb rubber to the reheated asphalt rubber binder, the binder must undergo a 45-minute reaction period. The added scrap tire crumb rubber must not exceed 10 percent of the total asphalt rubber binder weight. Reheated and reacted asphalt rubber binder must comply with the viscosity specifications. Do not reheat asphalt rubber binder more than twice.

04-18-14

39-3.02D Aggregates

39-3.02D(1) General

For RHMA-G, before the addition of asphalt binder and lime treatment, the aggregate must comply with the requirements shown in the following table:

10-30-15

Aggregate Quality

Quality characteristic	Test method	Requirement
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	AASHTO T 335	 -- 90 70
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Sand equivalent (min)[a, b]	AASHTO T 176	47
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	Report only
Fine aggregate angularity (min, %)[c]	AASHTO T 304 Method A	45

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[c]The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate, except if your JMF fails verification. Manufactured sand is fine aggregate produced by crushing rock or gravel.

04-18-14

39-3.02D(2) Aggregate Gradations

The aggregate gradations for RHMA-G must comply with the requirements shown in the following table:

10-17-14

Aggregate Gradation Requirements

RHMA-G pavement thickness shown	Gradation
0.10 to less than 0.20 foot	1/2 inch
0.20 foot or greater	3/4 inch

For RHMA-G, the aggregate gradations must be within the target value limits for the specified sieve size shown in the following tables:

Aggregate Gradations for RHMA-G
(Percentage Passing)

3/4 inch

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	--
3/4"	95–98	TV ± 5
1/2"	83–87	TV ± 6
3/8"	65–70	TV ± 5
No. 4	28–42	TV ± 6
No. 8	14–22	TV ± 5
No. 200	0.0–6.0	TV ± 2.0

1/2 inch

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	--
1/2"	90–98	TV ± 6
3/8"	83–87	TV ± 5
No. 4	28–42	TV ± 6
No. 8	14–22	TV ± 5
No. 200	0.0–6.0	TV ± 2.0

39-3.02E Rubberized Hot Mix Asphalt–Gap Graded Production

Asphalt rubber binder must be from 375 to 425 degrees F when mixed with aggregate.

If the dry and wet moisture susceptibility test result for treated plant-produced RHMA-G is less than the RHMA-G mix design requirement for dry and wet moisture susceptibility strength, the minimum dry and wet strength requirement is waived, but you must use one of the following treatments:

1. Aggregate lime treatment using the slurry method
2. Aggregate lime treatment using the dry lime method
3. Liquid antistrip treatment of HMA

39-3.03 CONSTRUCTION

Use a material transfer vehicle when placing RHMA-G.

Do not use a pneumatic tired roller to compact RHMA-G.

10-17-14

Spread and compact RHMA-G at an atmospheric temperature of at least 55 degrees F and a surface temperature of at least 60 degrees F.

If the atmospheric temperature is below 70 degrees F, cover loads in trucks with tarps. The tarps must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface. Tarps are not required if the time from discharge to truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes.

For RHMA-G placed under method compaction:

1. Complete the 1st coverage of breakdown compaction before the surface temperature drops below 285 degrees F.
2. Complete breakdown and intermediate compaction before the surface temperature drops below 250 degrees F. Use a static steel-tired roller instead of the pneumatic-tired roller for intermediate compaction.
3. Complete finish compaction before the surface temperature drops below 200 degrees F.

04-18-14

Spread sand at a rate between 1 and 2 lb/sq yd on new RHMA-G pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with section 90-1.02C(3). Keep traffic off the pavement until spreading of the sand is complete.

39-3.04 PAYMENT

Not Used

39-4 OPEN GRADED FRICTION COURSES

39-4.01 GENERAL

39-4.01A Summary

Section 39-4 includes specifications for producing and placing open graded friction courses. Open graded friction courses include HMA-O, RHMA-O, and RHMA-O-HB.

You may produce OGFC using a warm mix asphalt technology.

39-4.01B Definitions

Reserved

39-4.01C Submittals

Submit a complete JMF, except do not specify an asphalt binder content.

10-30-15

For RHMA-O and RHMA-O-HB, the JMF submittal must comply with section 39-3.01C(3).

04-18-14

39-4.01D Quality Control and Assurance

39-4.01D(1) General

Reserved

39-4.01D(2) Quality Control

39-4.01D(2)(a) General

Reserved

39-4.01D(2)(b) Asphalt Rubber Binder

For RHMA-O and RHMA-O-HB, the asphalt rubber binder must comply with the specifications in 39-3.01D(3)(b).

39-4.01D(2)(c) Aggregate

Test the quality characteristics of aggregate under the test methods and frequencies shown in the following table:

10-30-15

Aggregate Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Gradation	AASHTO T 27	1 per 750 tons and any remaining part
Moisture content[a]	AASHTO T 255	1 per 1500 tons and any remaining part
Crushed particles	AASHTO T 335	1 per 10,000 tons or 2 per project, whichever is greater
Los Angeles rattler	AASHTO T 96	
Flat and elongated particles	ASTM D4791	

[a]Test at continuous mixing plants only

For lime treated aggregate, test aggregate before treatment and test for gradation and moisture content during OGFC production.

39-4.01D(2)(d) Open Graded Friction Course Production

Test the quality characteristics of OGFC under the test methods and frequencies shown in the following table:

OGFC Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Asphalt binder content	AASHTO T 308 Method A	1 per 750 tons and any remaining part
HMA moisture content	AASHTO T 329	1 per 2,500 tons but not less than 1 per paving day

39-4.01D(3) Department Acceptance

39-4.01D(3)(a) General

The Department accepts OGFC based on compliance with:

1. Aggregate quality requirements shown in the following table:

Aggregate Quality

Quality characteristic	Test method	Requirement
Aggregate gradation	AASHTO T 27	JMF ± Tolerance
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	AASHTO T 335	 90 90 90
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Flat and elongated particles (max, % by weight @ 5:1)	ASTM D4791	Report only

2. In-place OGFC quality requirements shown in the following table:

OGFC Acceptance In Place

Quality characteristic	Test method	Requirement
Asphalt binder content (%)	AASHTO T 308 Method A	JMF -0.40, +0.50
HMA moisture content (max, %)	AASHTO T 329	1.00

39-4.01D(3)(b) Asphalt Rubber Binder

The Department accepts asphalt rubber binder in RHMA-O and RHMA-O-HB under 39-3.01D(5)(b).

39-4.01D(3)(c) Pavement Smoothness

Pavement smoothness of OGFC must comply with the Mean Roughness Index requirements shown in the following table for a 0.1 mile section:

OGFC Pavement Smoothness Acceptance Criteria

OGFC placement on	Mean Roughness Index requirement
New construction or HMA overlay	60 in/mi or less
Existing pavement	75 in/mi or less
Milled surface	75 in/mi or less

39-4.01D(3)(d)–39-4.01D(3)(f) Reserved

39-4.02 MATERIALS

39-4.02A General

When mixed with asphalt binder, aggregate must not be more than 325 degrees F except aggregate for OGFC with unmodified asphalt binder must be not more than 275 degrees F.

39-4.02B Open Graded Friction Course Mix Design

The Department determines the asphalt binder content under California Test 368 within 20 days of your complete JMF submittal and provides you a Caltrans Hot Mix Asphalt Verification form.

For OGFC, the 1st paragraph of section 39-1.02B(1) does not apply.

39-4.02C Asphalt Binder

Asphalt rubber binder in RHMA-O and RHMA-O-HB must comply with section 39-3.02C.

39-4.02D Aggregate

39-4.02D(1) General

Aggregate must comply with the requirements shown in the following table:

Aggregate Quality

Quality characteristic	Test method	Requirement
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	AASHTO T 335	 -- 90 90
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 40
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	Report only

39-4.02D(2) Aggregate Gradations

10-17-14

The aggregate gradations for HMA-O must comply with the requirements shown in the following table:

Aggregate Gradation Requirements

HMA-O pavement thickness shown	Gradation
0.10 foot or greater to less than 0.15 foot	1/2 inch
0.15 foot or greater	1 inch

The aggregate gradations for RHMA-O and RHMA-O-HB must comply with the requirements shown in the following table:

Aggregate Gradation Requirements

RHMA-O and RHMA-O-HB pavement thickness shown	Gradation
0.10 foot or greater	1/2 inch

04-18-14

For RHMA-O and RHMA-O-HB, the 1-inch aggregate gradation is not allowed.

For OGFC, the aggregate gradations must be within the target value limits for the specified sieve size shown in the following tables:

Aggregate Gradations for OGFC
(Percentage Passing)

1 inch

Sieve size	Target value limit	Allowable tolerance
1 1/2"	100	--
1"	99–100	TV ± 5
3/4"	85–96	TV ± 5
1/2"	55–71	TV ± 6
No. 4	10–25	TV ± 7
No. 8	6–16	TV ± 5
No. 200	0.0–6.0	TV ± 2.0

1/2 inch

Sieve size	Target value limit	Allowable tolerance
3/4"	100	--
1/2"	95–100	TV ± 6
3/8"	78–89	TV ± 6
No. 4	28–37	TV ± 7
No. 8	7–18	TV ± 5
No. 30	0–10	TV ± 4
No. 200	0.0–3.0	TV ± 2.0

If lime treatment is required, you may reduce the lime ratio for the combined aggregate from 1.0 to 0.5 percent for OGFC.

39-4.03 CONSTRUCTION

Use a material transfer vehicle when placing OGFC.

If the atmospheric temperature is below 70 degrees F, cover loads in trucks with tarps. The tarps must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface. Tarps are not required if the time from discharge to truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes.

Apply a tack coat before placing OGFC. The tack coat application rate must comply with the requirements of the following table:

Tack Coat Application Rates for OGFC

OGFC over:	Minimum Residual Rates (gal/sq yd)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA	0.03	0.04	0.03
PCC and existing AC surfacing	0.05	0.06	0.04
Planed pavement	0.06	0.07	0.05

Compact OGFC with steel-tired, 2-axle tandem rollers. If placing over 300 tons of OGFC per hour, use at least 3 rollers for each paver. If placing less than 300 tons of OGFC per hour, use at least 2 rollers for each paver. Each roller must weigh between 126 to 172 lb per linear inch of drum width. Turn the vibrator off.

Compact OGFC with 2 coverages. The Engineer may order fewer coverages if the layer thickness of OGFC is less than 0.20 foot.

For HMA-O with unmodified asphalt binder:

1. Spread and compact only if the atmospheric temperature is at least 55 degrees F and the surface temperature is at least 60 degrees F.
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 240 degrees F.
3. Complete all compaction before the surface temperature drops below 200 degrees F.

For HMA-O with modified asphalt binder except asphalt rubber binder:

1. Spread and compact only if the atmospheric temperature is at least 50 degrees F and the surface temperature is at least 50 degrees F.
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 240 degrees F.
3. Complete all compaction before the surface temperature drops below 180 degrees F.

For RHMA-O and RHMA-O-HB:

1. Spread and compact only if the atmospheric temperature is at least 55 degrees F and surface temperature is at least 60 degrees F.
2 Complete the 1st coverage using 2 rollers before the surface temperature drops below 280 degrees F.
3. Complete compaction before the surface temperature drops below 250 degrees F.

Spread sand at a rate between 1 and 2 lb/sq yd on new 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(3). Keep traffic off the pavement until spreading sand is complete.

If you choose to correct OGFC for smoothness, the Engineer determines if the corrective method causes raveling. OGFC that is raveling must be removed and replaced.

39-4.04 PAYMENT

Not Used

39-5 BONDED WEARING COURSES

39-5.01 GENERAL

39-5.01A General

39-5.01A(1) Summary

Section 39-5 includes specifications for producing and placing bonded wearing courses.

10-30-15

BWC consists of placing a polymer modified asphaltic emulsion and the specified HMA in a single pass with an integrated paving machine.

04-18-14

BWC using RHMA-G, RHMA-O, or HMA-O must comply with the specifications for RHMA-G, RHMA-O, or HMA-O.

39-5.01A(2) Definitions

Reserved

39-5.01A(3) Submittals

With your JMF submittal, include:

1. Asphaltic emulsion target residual rate
2. Weight ratio of water to bituminous material in the original asphaltic emulsion

Within 3 business days following the 1st job site delivery, submit test results for asphaltic emulsion properties performed on a sample taken from the asphaltic emulsion delivered.

Within 1 business day of each job site delivery of asphaltic emulsion, submit to METS a 2-quart sample and a certificate of compliance. Ship each sample so that it is received at METS within 48 hours of sampling.

Each day BWC is placed, submit the residual and application rate for the asphaltic emulsion.

During production, submit certified volume or weight slips for the materials supplied.

39-5.01A(4) Quality Control and Assurance

39-5.01A(4)(a) General

For each job site delivery of asphaltic emulsion, take a 2-quart sample in the presence of the Engineer. Take samples from the delivery truck at mid-load from a sampling tap or thief. If the sample is taken from the tap, draw and discard 4 quarts before sampling.

If you unload asphalt binder or asphaltic emulsion into a bulk storage tank, do not use material from the tank until you submit test results for a sample taken from the bulk storage tank. Testing must be performed by an AASHTO-accredited laboratory.

39-5.01A(4)(b) Quality Control

Sample BWC in two 1-gallon metal containers.

The asphaltic emulsion must be tested under ASTM D2995 at least once per paving day at the job site.

39-5.01A(4)(c) Department Acceptance

The Department accepts asphaltic emulsion based on compliance with the requirements shown in the following table:

10-17-14

Asphaltic Emulsion

Quality characteristic	Test method	Requirement
Saybolt Furol Viscosity at 25 °C (SFS) [a]	AASHTO T 59	20–100
Sieve test on original emulsion at time of delivery (max, %)	AASHTO T 59	0.05
24-hour storage stability (max, %)	AASHTO T 59	1
Residue by evaporation (min, %)	California Test 331	63
Tests on residue from evaporation test:		
Torsional recovery, measure entire arc of recovery at 25 °C (min, %)	California Test 332	40
Penetration at 25 °C (0.01 mm)	AASHTO T 49	70–150

[a]SFS means Saybolt Furol seconds

04-18-14

The Department accepts the BWC based on the submitted asphaltic emulsion target residual rate ±0.02 gal/sq yd when tested under ASTM D2995.

39-5.01B Materials

39-5.01B(1) General

Reserved

39-5.01B(2) Asphaltic Emulsion

The asphaltic emulsion must comply with the requirements shown in the following table:

10-17-14

Asphaltic Emulsion

Quality characteristic	Test method	Requirement
Saybolt Furol Viscosity at 25 °C (SFS) [a]	AASHTO T 59	20–100
Sieve test on original emulsion at time of delivery (max, %)	AASHTO T 59	0.05
24-hour storage stability (max, %)	AASHTO T 59	1
Residue by evaporation (min, %)	California Test 331	63
Tests on residue from evaporation test:		
Torsional recovery, measure entire arc of recovery at 25 °C (min, %)	California Test 332	40
Penetration at 25 °C (0.01 mm)	AASHTO T 49	70–150

[a] SFS means Saybolt Furol seconds

04-18-14

39-5.01B(3) Reserved

39-5.01C Construction

39-5.01C(1) General

Use method compaction for BWC.

Do not dilute the asphaltic emulsion.

Do not place BWC if rain is forecast for the project area within 24 hours by the National Weather Service.

39-5.01C(2) Spreading and Compacting Equipment

01-15-16

Use a material transfer vehicle when placing BWC. The material transfer vehicle must receive HMA directly from the truck.

Use an integrated distributor paver capable of spraying the asphaltic emulsion, spreading the HMA, and leveling the mat surface in 1 pass.

Apply asphaltic emulsion at a uniform rate for the full paving width. The asphaltic emulsion must not be touched by any part of the paver including wheels or tracks.

If the spray bar is adjusted for changing pavement widths, the paver must prevent excess spraying of asphaltic emulsion beyond 2 inches of the HMA edge.

39-5.01C(3) Applying Asphaltic Emulsion

10-17-14

Before spreading HMA, apply asphaltic emulsion on dry or damp pavement with no free water.

04-18-14

Apply emulsion at a temperature from 120 to 180 degrees F and in a single application at the residual rate specified for the condition of the underlying surface. Asphaltic emulsion must have a target residual rate for the surfaces to receive the emulsion as shown in the following table:

Asphaltic Emulsion Target Residual Rate

Surface to receive asphaltic emulsion	Target residual rates (gal/sq yd)
PCC pavement	0.09–0.11
Dense, compacted, new HMA pavement	0.11–0.14
Open textured, dry, aged or oxidized existing AC pavement	0.13–0.17

If requested and authorized, you may change the asphaltic emulsion application rates.

39-5.01C(4) Placing and Compacting Hot Mix Asphalt

Construct a transverse joint if the HMA remains in the paver for more than 30 minutes.

Do not reintroduce HMA spread over asphaltic emulsion into the paving process.

Do not overlap or hot lap HMA. Pave through lanes after paving adjacent:

1. Shoulders
2. Tapers
3. Transitions
4. Road connections
5. Driveways
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Turn pockets
10. Ramps

For BWC placed on areas adjacent to through lanes that extend into the through lanes, cut the BWC to a neat, straight vertical line at the lane line.

If you spill asphaltic emulsion into the paver hopper, stop paving and remove the contaminated material.

10-30-15

39-5.01D Payment

Payment for asphaltic emulsion is not included in the payment for the type of HMA used in a bonded wearing course.

04-18-14

39-5.02 BONDED WEARING COURSES-GAP GRADED

39-5.02A General

39-5.02A(1) Summary

Section 39-5.02 includes specifications for producing bonded wearing course-gap graded.

39-5.02A(2) Definitions

Reserved

39-5.02A(3) Submittals

Include film thickness and calculations and AASHTO T 305 results with your JMF submittal.

39-5.02A(4) Quality Control and Assurance

39-5.02A(4)(a) General

Reserved

39-5.02A(4)(b) Quality Control

39-5.02A(4)(b)(i) General

Reserved

39-5.02A(4)(b)(ii) Aggregate

Test the quality characteristics of aggregate under the test methods and frequencies shown in the following table:

10-30-15

Aggregate Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Gradation	AASHTO T 27	1 per 750 tons and any remaining part
Sand equivalent[a, b]	AASHTO T 176	
Moisture content[c]	AASHTO T 255	1 per 1500 tons and any remaining part
Crushed particles	AASHTO T 335	1 per 10,000 tons or 2 per project, whichever is greater
Los Angeles rattler	AASHTO T 96	
Flat and elongated particles	ASTM D4791	
Fine aggregate angularity	AASHTO T 304 Method A	

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2, and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.
[c]Test at continuous mixing plants only.

04-18-14

For lime treated aggregate, test aggregate before treatment and test for gradation and moisture content during BWC-G production.

39-5.02A(4)(b)(iii) Hot Mix Asphalt Production

Sample BWC in two 1-gallon metal containers.

Test the quality characteristics of BWC-G under the test methods and frequencies shown in the following table:

BWC-G Testing Frequencies

Quality characteristic	Test method	Minimum testing frequency
Asphalt binder content	AASHTO T 308 Method A	1 per 750 tons and any remaining part
HMA moisture content	AASHTO T 329	1 per 2,500 tons but not less than 1 per paving day

39-5.02A(4)(b)(iv)–39-5.02A(4)(b)(vii) Reserved

39-5.02A(4)(c) Department Acceptance

The Department accepts BWC-G based on compliance with:

1. Asphalt binder content at JMF -0.40, +0.50 percent when tested under AASHTO T 308, Method A.
2. Aggregate quality requirements shown in the following table:

10-30-15

Aggregate Quality

Quality characteristic	Test method	Requirement
Aggregate gradation	AASHTO T 27	JMF ± Tolerance
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	AASHTO T 335	 -- 90 85
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 35
Sand equivalent (min)	AASHTO T 176	47
Flat and elongated particles (max, % by weight at 5:1)	ASTM D4791	25
Fine aggregate angularity (min, %)	AASHTO T 304 Method A	45

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.

04-18-14

39-5.02B Materials

39-5.02B(1) General

Reserved

39-5.02B(2) Mix Design

For BWC-G, the 1st paragraph of section 39-1.02B(1) does not apply.

01-15-16

Determine the proposed OBC from a mix design that complies with the requirements shown in the following table:

Hot Mix Asphalt Mix Design Requirements

Quality characteristic	Test method	Requirement
Film thickness (min, µm)	Asphalt Institute MS-2 Table 8.1[a]	12
Drain down (max, %)	AASHTO T 305 [b]	0.1

[a] Film thickness is calculated based on the effective asphalt content and determined as follows:

$$FT = \left(\frac{P_{be}}{SA \times G_b \times 1000} \right) 10^6$$

Where:

FT = Film thickness in µm
P_{be} = Effective asphalt content by total weight of mix using the MS-2 Asphalt Mix Design Methods
SA = Estimated surface area of the aggregate blend in m2/kg from Table 8.1 in the Asphalt Institute MS-2 Asphalt Mix Design Methods, 7th Edition
G_b = Specific gravity of asphalt binder

[b] Combine aggregate and asphalt at the asphalt binder supplier's instructed mixing temperature. Coated aggregates that fall through the wire basket during loading must be returned to the basket before conditioning at 350 °F for 1 hour.

The OBC must be greater than 4.9 percent by total weight of mix.

39-5.02B(3) Asphalt Binder

Reserved

39-5.02B(4) Aggregate

The aggregate must comply with the requirements shown in the following table:

10-30-15

Aggregate Quality

Quality characteristic	Test method	Requirement
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	AASHTO T 335	 -- 90 85
Los Angeles Rattler (max, %) Loss at 100 Rev. Loss at 500 Rev.	AASHTO T 96	 12 35
Sand equivalent (min)	AASHTO T 176	47
Flat and elongated particles (max, % by weight @ 5:1)	ASTM D4791	25
Fine aggregate angularity (min, %)	AASHTO T 304 Method A	45

[a]Reported value must be the average of 3 tests from a single sample.
[b]Use of a sand reading indicator is required as shown in AASHTO T 176, Figure 1. Sections 4.7, 7.1.2, 8.4.2 and 8.4.3 do not apply. Prepare the stock solution as specified in section 4.8.1, except omit the addition of formaldehyde.

04-18-14

The aggregate gradations for BWC-G must comply with the requirements shown in the following table:

10-17-14

Aggregate Gradation Requirements

BWC-G pavement thickness shown	Gradation
less than 0.08 foot	No. 4 or 3/8 inch
0.08 foot or greater	1/2 inch

04-18-14

The proposed aggregate gradation must be within the TV limits for the specified sieve sizes shown in the following tables:

Aggregate Gradations for BWC-G
(Percentage Passing)

1/2 inch

Sieve sizes	Target value limits	Allowable tolerance
3/4"	100	--
1/2"	80–100	TV ± 6
3/8"	55–80	TV ± 6
No. 4	25–40	TV ± 7
No. 8	19–32	TV ± 5
No. 16	16–22	TV ± 5
No. 30	10–18	TV ± 4
No. 50	8–13	TV ± 4
No. 100	6–10	TV ± 2
No. 200	4.0–7.0	TV ± 2.0

3/8 inch

Sieve sizes	Target value limits	Allowable tolerance
1/2"	100	--
3/8"	80–100	TV ± 6
No. 4	25–40	TV ± 7
No. 8	19–32	TV ± 5
No. 16	16–22	TV ± 5
No. 30	10–18	TV ± 4
No. 50	8–13	TV ± 4
No. 100	7–11	TV ± 2
No. 200	6.0–10.0	TV ± 2.0

No. 4

Sieve sizes	Target value limits	Allowable tolerance
1/2"	100	--
3/8"	95–100	TV ± 2
No. 4	42–55	TV ± 7
No. 8	19–32	TV ± 5
No. 16	16–22	TV ± 5
No. 30	10–18	TV ± 4
No. 50	8–13	TV ± 4
No. 100	7–11	TV ± 2
No. 200	6.0–10.0	TV ± 2.0

39-5.02C Construction

10-30-15

Apply asphaltic emulsion when the atmospheric and pavement temperatures are above 50 degrees F.

39-5.02D Payment

Not Used

39-6 HOT MIX ASPHALT ON BRIDGE DECKS

39-6.01 GENERAL

Section 39-6 includes specifications for producing and placing hot mix asphalt on bridge decks.

HMA used for bridge decks must comply with the specifications for Type A HMA in section 39-2.

39-6.02 MATERIALS

Do not use the 1-inch or 3/4-inch aggregate gradation for HMA on bridge decks.

The grade of asphalt binder for HMA must be PG 64-10 or PG 64-16.

39-6.03 CONSTRUCTION

Spread and compact HMA on bridge decks using method compaction.

If a concrete expansion dam is to be placed at a bridge deck expansion joint, tape oil-resistant construction paper to the deck over the area to be covered by the dam before placing the tack coat and HMA across the joint.

Apply tack coat at the minimum residual rate specified in section 39-1.03C(5). For HMA placed on a deck seal, use the minimum residual rate specified for PCC.

For HMA placed on a deck seal:

1. Place the HMA within 7 days after installing the deck seal.
2. If a paper mask is placed on the deck under section 54-5.03, place the HMA continuously across the paper mask.
3. Place HMA in at least 2 approximately equal layers.
4. For placement of the 1st HMA layer:
   - 4.1. Comply with the HMA application temperature recommended by the deck seal manufacturer.
   - 4.2. Deliver and place HMA using equipment with pneumatic tires or rubber-faced wheels. Do not operate other vehicles or equipment on the bare deck seal.
   - 4.3. Deposit HMA on the deck seal in such a way that the deck seal is not damaged. Do not use a windrow.
   - 4.4. Place HMA in a downhill direction on bridge decks with grades over 2 percent.
   - 4.5. Self-propelled spreading equipment is not required.

39-6.04 PAYMENT

Not Used

39-7 MINOR HOT MIX ASPHALT

39-7.01 GENERAL

39-7.01A Summary

Section 39-7 includes specifications for producing and placing minor hot mix asphalt.

Minor HMA must comply with section 39-2 except as specified in this section 39-7.

39-7.01B Definitions

Reserved

39-7.01C Submittals

The QC plan, test results, and inertial profiler specifications in sections 39-1.01C(3), 39-1.01C(4), 39-1.01C(13)(c)–(d) do not apply.

39-7.01D Quality Control and Assurance

39-7.01D(1) General

For minor HMA, the JMF renewal, inertial profiler certifications and testing, and prepaving meeting specifications in sections 39-1.01D(4), 39-1.01D(6)(c), and 39-1.01D(7) do not apply.

Test pavement smoothness with a 12 foot straightedge.

39-7.01D(2) Quality Control

For minor HMA, section 39-2.01D(2) applies except testing for compliance with the following quality characteristics is not required:

1. Flat and elongated particles
2. Fine aggregate angularity
3. Hamburg wheel track
4. Moisture susceptibility

39-7.01D(3) Department Acceptance

The Department accepts minor HMA under section 39-2.01D(5) except compliance with the following quality characteristics is not required:

1. Flat and elongated particles
2. Fine aggregate angularity
3. Hamburg wheel track
4. Moisture susceptibility

39-7.02 MATERIALS

39-7.02A General

Reserved

39-7.02B Mix Design

The mix design for minor HMA must comply with section 39-2.02B except the Hamburg wheel track and moisture susceptibility requirements do not apply.

39-7.02C Asphalt Binder

The grade of asphalt binder for minor HMA must be PG-64-10 or PG-64-16.

39-7.02D Liquid Antistrip Treatment

10-17-14

Treat minor HMA with liquid antistrip. Liquid antistrip treatment is not required if you submit AASHTO T 283 and AASHTO T 324 (Modified) test results showing compliance with section 39-2.02B. The tests must be dated within 12 months of submittal.

04-18-14

39-7.03 CONSTRUCTION

Not Used

39-7.04 PAYMENT

Not Used

39-8–39-10 RESERVED

^^

40 CONCRETE PAVEMENT

10-30-15

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:

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

where:

n_c = Number of 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

10-30-15

Construct edge treatments as shown. Regrade when required for the preparation of tapered edge areas.

Sections 40-1.03J(2) and 40-1.03J(3) do not apply to tapered edges.

For tapered edges placed after the concrete pavement is complete, concrete may comply with the requirements for minor concrete.

For tapered edges placed after the concrete pavement is complete, install connecting bar reinforcement under section 52.

Saw cutting or grinding may be used to construct tapered edges.

For tapered 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.

07-19-13

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

10-30-15

Construct shoulder rumble strips by 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.

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,

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.

07-19-13

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

10-30-15

Replace the headings and paragraphs in section 41 with:

10-30-15

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, MSDS, and certificates of compliance. 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:

1. Allow 14 days for sampling and testing of the polyester resin binder
2. Arrange for a representative from the manufacturer to provide training for:
   - 2.1. Cleaning and preparing the area
   - 2.2. Mixing and applying the bonding agent
   - 2.3. Mixing, placing, and curing polyester concrete

Do not use polyester concrete until your personnel and the Department's personnel have been trained.

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 (min, MPa) Type I specimen, 6.3 ± 0.76 mm (0.25 ± 0.03 inch) thick Speed of testing = 11.4 mm/min (0.45 inch/minute) Condition 18/25/50+5/70: T—23/50	ASTM D638 ASTM D618	17.24 (2,500 psi)
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/

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 sections 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 the specifications for minor HMA in section 39.

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

41-4.01A Summary

Section 41-4 includes specifications for repairing spalls in concrete pavement.

41-4.01B Definitions

Reserved

41-4.01C Submittals

Reserved

41-4.01D Quality Control and Assurance

The Engineer accepts spall repairs based on authorized dimensions and visual inspection.

41-4.02 MATERIALS

Bonding agent must comply with the requirements for HMWM in section 41-3.02 except the tack-free time requirements do not apply and the HMWM must not contain wax.

Caulk must be at least 50 percent silicone, designated as a concrete sealant, and comply with ASTM C834.

Form board must be single-wall, double-face corrugated cardboard or paperboard covered with a bond breaker on each face. For existing joints or cracks less than 45 mils wide, use paperboard.

41-4.03 CONSTRUCTION

41-4.03A General

Prepare spall areas by removing concrete and cleaning. Provide compression relief at joints and cracks by using a form board or saw cutting.

Repair spalls using polyester concrete with a bonding agent.

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 Compression Relief at Joints and Cracks

41-4.03D(1) Form Board Installation

Before placing concrete, place the form board to match the existing joint or crack alignment and width. Extend the form board at least 3 inches beyond each end of the repair and at least 1 inch deeper than the repair.

After placing concrete, remove the form board before sealing joints or cracks.

41-4.03D(2) Saw Cut Method

After cleaning, seal the existing joint or crack and any other exposed cracks with caulk at the bottom and sides of the repair area. Any surface receiving caulk must be clean and dry. Place caulk a minimum of 1/2 inch beyond the edges of the repair area into the existing joint or crack.

Saw cut the polyester concrete to the full depth along the existing joint or crack alignment within 2 hours from time of final setting. Use a power-driven saw with a diamond blade.

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 General

Reserved

41-6.03B 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.

41-6.03C Seating

Seat cracked concrete by making at least 5 passes over the cracked concrete with either:

1. Oscillating type pneumatic-tired roller at least 4 feet wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 60 psi minimum and maintained so that the air pressure does not vary more than 5 psi. The roller's gross static weight must be 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.

41-6.03D 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 minor HMA under section 39. Use the no. 4 gradation.
2. Remove all loose debris and sweep the pavement.

41-6.03E 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 minor HMA that complies with section 39. 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 C31. 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–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 Placing 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 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.

41-9.03E Joints

41-9.03E(1) General

Joints must be vertical.

41-9.03E(2) Construction Joints

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.

41-9.03E(3) Contraction Joints

Saw contraction joints before cracking occurs and after the RSC is hard enough to saw without spalling, raveling, or tearing. Cut contraction joints to a minimum of 1/3 the slab depth. Use a power-driven saw with a diamond blade.

Match transverse contraction joints with existing joint spacing and skew unless otherwise described. Where the existing transverse joint spacing in an adjacent lane exceeds 15 feet, construct an additional transverse contraction joint midway between the existing joints.

Cut transverse contraction joints across the full slab replacement width. After cutting, immediately wash slurry from the joint with water at less than 100 psi pressure.

Longitudinal contraction joints must be parallel with the concrete pavement centerline, except when lanes converge or diverge. Transverse and longitudinal contraction joints must not deviate by more than 0.1 foot from either side of a 12-foot straight line. For longitudinal joints parallel to a curved centerline radius less than 7000 feet, compensate for curvature.

Keep joints free from foreign material including soil, gravel, concrete, and asphalt.

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–41-9.03K 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 (horizontal 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

^^^

Add to section 46-1.02:

07-19-13

46-1.02C Grout

Grout must consist of cement and water and may contain an admixture if authorized. Cement must comply with section 90-1.02B(2). Water must comply with section 90-1.02D. Admixtures must comply with 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.

Replace the 1st sentence of the 1st paragraph in section 46-2.01D(2)(a) with:

10-30-15

Performance test ground anchors as described.

Replace the 1st sentence of the 1st paragraph in section 46-2.01D(2)(c) with:

10-30-15

Ground anchors that are performance- or proof-tested must comply with the following:

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.

Replace the 3rd paragraph in section 46-2.03A with:

10-30-15

Sheathe the tendons in the unbonded length with smooth plastic sheathing that extends into the steel tube of the permanent anchorage assembly. Sheathe the tendons full length with corrugated plastic sheathing.

Replace the 7th paragraph in section 46-2.03A with:

10-30-15

Drill the holes for ground anchors in the foundation material deep enough to provide the necessary bonded length beyond the minimum unbonded length shown.

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

07-18-14

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:

07-18-14

Steel wire must comply with the specifications for plain wire reinforcement in ASTM A1064/A1064M. Welded wire reinforcement must comply with the specifications for plain wire welded wire reinforcement in ASTM A1064/A1064M.

Hooks and bends must comply with the *Building Code Requirements for Structural Concrete* published by ACI.

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

01-15-16

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.

01-15-16

Delete the 4th paragraph of section 49-2.01C(5).

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 between the 3rd and 4th paragraphs of section 49-3.02C(2):

07-18-14

If drilling slurry is used during excavation, maintain the slurry level at least 10 feet above the piezometric head.

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.

Replace item 3 in the list in the 11th paragraph of section 49-3.02C(8) with:

07-18-14

3. Maintain the slurry level at least10 feet above the piezometric head

Add to section 49-3.03A(3):

01-15-16

Submit a *Pile and Driving Data Form* under section 49-2.01A(3)(a) if specified in the special provisions.

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.

Replace section 49-4.03 with:

01-15-16

49-4.03 CONSTRUCTION

49-4.03A General

Reserved

49-4.03B Drilled Holes

Drill holes for steel soldier piles into natural foundation material. Drilled holes must be accurately located, straight, and true.

Furnish and place temporary casings or tremie seals where necessary to control water or to prevent caving of the hole.

Before placing the steel soldier pile, remove loose materials existing at the bottom of the hole after drilling activities have been completed.

Do not allow surface water to enter the hole. Remove all water in the hole before placing concrete.

If temporary casings are used, they must comply with section 49-3.02C(3).

49-4.03C Steel Soldier Piles

Plumb and align the pile before placing concrete backfill and lean concrete backfill. The pile must be at least 2 inches clear of the sides of the hole for the full length of the hole to be filled with concrete backfill and lean concrete backfill. Ream or enlarge holes that do not provide the clearance around steel piles.

Maintain alignment of the pile in the hole while placing backfill material.

Clean and prepare piles in anticipated heat affected areas before splicing steel piles or welding concrete anchors.

^^

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

10-30-15

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 3rd item in the list in the 1st paragraph of section 51-1.01C(4) with:

10-30-15

3. Proposed aggregate gradation

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 of section 51-1.01D(4)(b) with:

10-30-15

Except for POCs, surface smoothness is tested using:

1. 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.
2. 12-foot-long straightedge placed transversely to traffic.

For POCs, surface smoothness is tested using:

1. 12-foot-long straightedge placed parallel to the centerline of the POC
2. 6-foot-long straightedge placed perpendicular to the centerline of the POC

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.

Replace the 11th paragraph of section 51-1.03D(1) with:

10-30-15

If concrete is inaccessible for adequate consolidation by other means, external vibrators must be used and the forms must be sufficiently rigid to resist displacement or damage.

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.

Replace the 1st sentence of the 1st paragraph of section 51-1.03F(5)(a) with:

10-30-15

Construct concrete roadway surfaces of structures, approach slabs, sleeper slabs, and adjoining approach pavement, and concrete decks to be covered with another material, to the grade and cross section 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:

07-18-14

51-1.03F(5)(b)(i) General

Except for bridge widenings, texture roadway surfaces of bridge decks, approach slabs, and sleeper slabs, and other roadway surfaces of concrete structures longitudinally by grinding and grooving or by longitudinal tining.

For bridge widenings, texture the roadway surfaces 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 the 1st sentence of the 2nd paragraph of section 51-2.02C(3) with:

10-30-15

Thoroughly clean contact surfaces and the top surface of the seal to within 1/2 inch from either edge immediately before applying the lubricant-adhesive.

Replace "sets" in the 1st and 2nd paragraphs of section 51-2.02D(1)(c)(ii) with:

04-19-13

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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 the 1st sentence of the 6th paragraph of section 51-2.02E(3) with:

10-30-15

Install each assembly with a watertight, continuous return 6 inches up into barriers at the low side of the deck.

Replace "sets" in the 1st and 2nd paragraphs of section 51-2.02F(1)(c) with:

04-19-13

copies

Replace the paragraph in section 51-2.04A(3) with:

10-30-15

Submit a certificate of compliance for waterstop material. The certificate of compliance for PVC waterstop must include a statement that the material complies with Item 6 of Army Corps of Engineers CRD-C 572.

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

10-30-15

Delete the 3rd paragraph of section 51-4.01D.

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.

Replace the paragraph in section 51-5.02G with:

04-18-14

HMA for a temporary roadway structural section must comply with the specifications for minor HMA in section 39.

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

01-15-16

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 9th paragraph of section 52-1.03D with:

07-18-14

Terminate each unit of spiral reinforcement at both ends by lapping the spiral reinforcement on itself for at least 80 diameters followed by (1) a 135-degree hook with a 6-inch tail hooked around an intersecting longitudinal bar or (2) a mechanical lap splice coupler. Discontinuities in spiral reinforcement may be made only where shown or authorized. The spiral on each side of a discontinuity or a lap splice is a separate unit. Where discontinuities in spiral reinforcement are not allowed, splice the spiral reinforcement. Lap splices in spiral reinforcement must be lapped at least 80 diameters followed by (1) a 135-degree hook with a 6-inch tail hooked around an intersecting longitudinal bar or (2) a mechanical lap splice coupler.

Add to section 52-5.01D:

01-15-16

52-5.01D(4) Quality Assurance Testing

Secure, identify, and transport QA headed bar reinforcement test samples to METS as specified for production test samples in section 52-5.01D(3).

The Department tests headed bar reinforcement as specified for production testing in section 52-5.01D(3).

The Department will notify you of the QA test results for each bundle of 4 test samples of splices within 3 business days after METS receives the bundle unless more than 1 bundle is received on the same day, in which case allow 2 additional business days for each additional bundle received.

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

Replace the 4th paragraph of section 52-6.03B with:

01-15-16

For uncoated and galvanized reinforcing bars complying with ASTM A 615/A 615M, Grade 60, ASTM A 706/A 706M, or ASTM A 767/A 767M, Class 1, the length of lap splices must be at least:

1. 45 diameters of the smaller bar spliced for reinforcing bars no. 8 or smaller
2. 60 diameters of the smaller bar spliced for reinforcing bars nos. 9, 10, and 11

For epoxy-coated reinforcing bars and alternatives to epoxy-coated reinforcing bars complying with ASTM A 775/A 775M, ASTM A 934/A 934M, ASTM A 1035/A 1035M, or ASTM A 1055/A 1055M, the length of lap splices must be at least:

1. 65 diameters of the smaller bar spliced for reinforcing bars no. 8 or smaller
2. 85 diameters of the smaller bar spliced for reinforcing bars nos. 9, 10, and 11

^^

53 SHOTCRETE

01-15-16

Replace "632" in item 1 in the list in the 3rd paragraph of section 53-1.02 with:

01-15-16

675

Replace item 2 in the list in the 3rd paragraph of section 53-1.02 with:

01-15-16

2. You may substitute a maximum of 30 percent coarse aggregate for the fine aggregate. Coarse aggregate must comply with section 90-1, except section 90-1.02C(4)(d) does not apply. Grading for the coarse aggregate must comply with the grading specified in section 90-1.02C(4)(b) for the 1/2 inch x No. 4 or the 3/8 inch x No. 8 primary aggregate nominal size.

Replace "shotcrete" in the 2nd sentence of the 4th paragraph of section 53-1.02 with:

01-15-16

concrete

Replace the 2nd and 3rd paragraphs of section 53-2.01D(1) with:

10-30-15

Obtain cores for compressive strength testing under ASTM C1604/C1604M. Discard cores that contain bar reinforcement or other obstructions or show evidence of improper coring. Test cores for compressive strength at 28 days under ASTM C1604/C1604M at an authorized laboratory. The compressive strength is the average strength of at least 3 cores that are free from bar reinforcement or other obstructions.

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.

Replace item 2 in the list in the 4th paragraph of section 53-2.01D(3) with:

10-30-15

2. Obtain 3-inch-diameter cores from the test panel.

Replace item 4 in the list in the 4th paragraph of section 53-2.01D(3) with:

10-30-15

4. Test cores for compressive strength. Discard cores that show evidence of improper coring.

Replace the 1st paragraph of section 53-2.01D(4)(a) with:

10-30-15

Obtain at least four 3-inch-diameter test cores from each 50 cu yd, or portion thereof, of shotcrete placed each day. Three cores must be free from reinforcement or obstructions. One core must include reinforcement. The Engineer determines each core location.

Replace the 1st paragraph of section 53-2.01D(4)(b) with:

10-30-15

Each core must be dense and be free of laminations and sand pockets. Any core with reinforcement must show reinforcement or other obstructions completely encased.

10-30-15

Delete the 1st paragraph of section 53-2.01D(4)(c).

Replace "ASTM C42/C42M" in the 5th paragraph of section 53-2.01D(4)(c) with:

10-30-15

ASTM C1604/C1604M

^^

54 WATERPROOFING

10-30-15

Add between "be" and "3/8 inch" in the 3rd paragraph of section 54-4.02C:

04-20-12

at least

Replace the 2nd paragraph of section 54-4.03A with:

10-30-15

Sweep or air blow the concrete surfaces to receive the seal to clean them of dirt, dust, gravel, loose concrete particles, and other extraneous materials. Remove projections and fill depressions that could damage the membrane.

04-18-14

Delete the 3rd paragraph of section 54-5.01A.

04-18-14

Delete "and HMA" in the 2nd paragraph of section 54-5.03.

Replace the last paragraph of section 54-5.03 with:

04-18-14

Do not allow traffic on the seal until HMA is placed over it.

Add to section 54:

07-19-13

54-7 SILANE WATERPROOFING TREATMENT

Reserved

54-8–54-10 RESERVED

^^

55 STEEL STRUCTURES

10-30-15

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).

10-30-15

Delete the 7th paragraph of section 55-1.01D(3)(b)(i).

Replace item 5 in the list in the 3rd paragraph of section 55-1.01D(3)(b)(ii) with:

10-30-15

5. Assembly must not seize before the final rotation in step 9 is attained.

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 of section 55-1.02B(2) with:

10-30-15

Instead of machining, you may heat straighten steel slabs 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 1st paragraph of section 55-1.02B(5) with:

10-30-15

Pins must:

1. Be turned to the dimensions shown
2. Be straight, smooth, and free from flaws
3. Have the final surface produced by a finishing cut

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

10-30-15

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 the subheadings and paragraphs in section 56-3.01C with:

10-30-15

56-3.01C(1) General

Allow 30 days for the Department's review.

56-3.01C(2) Shop Drawings

Submit 2 copies of shop drawings for sign structures. Include:

1. Sign panel dimensions
2. Span lengths

3. Post heights
4. Anchorage layouts
5. Proposed splice locations
6. Snugging and tensioning pattern for anchor bolts and HS bolted connections
7. Details for permanent steel anchor bolt templates
8. Details of clips, eyes, or removable devices for preventing damage to the finished galvanized or painted surfaces used for:
   8.1 Securing the sign during shipping
   8.2 Lifting and moving during erection

56-3.01C(3) Quality Control Program

Submit a QC program for sign structures. Include methods, equipment, and personnel to be used during fabrication and installation.

Submit the QC program with the shop drawing submittal.

Replace "sets" in the 1st paragraph of section 56-3.01C(2) with:

04-19-13

copies

Replace the 1st and 2nd paragraphs of section 56-3.01D(2)(b) with:

10-30-15

For UT of welded joints with any members less than 5/16 inch thick or tubular sections less than 13 inches in diameter, the acceptance and repair criteria must comply with Clause 6.13.3.1 of AWS D1.1.

For UT of other welded joints, the acceptance and repair criteria must comply with Table 6.3 of AWS D1.1 for cyclically loaded nontubular connections.

Replace the 4th paragraph of section 56-3.02B with:

10-30-15

Structural tubing and hollow structural sections must be structural steel complying with ASTM A500/A500M, Grade B or ASTM A1085.

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

10-30-15

Replace the 2nd and 3rd paragraphs of section 57-2.01B(2) with:

10-30-15

Structural timber and lumber must be inspected and grade marked under the rules and specifications shown in the following table:

Replace the 9th paragraph of section 57-2.01B(2) with:

10-30-15

Glued laminated timbers must comply with ANSI/AITC A190.1 and AITC 117, published by the American Institute of Timber Construction.

10-30-15

Delete the 2nd and 4th paragraphs of section 57-2.01B(3).

Replace "51-2.01C(3)" in the 1st paragraph of section 57-2.01C(3)(a) with:

10-19-12

57-2.01C(3)

Add to section 57-2.01C(3)(a):

10-30-15

Treated timber must be preservative-treated Douglas fir or Hem-fir. Chromated copper arsenate must not be used for preservative treatment.

Add to section 57-2.02B:

10-30-15

Chromated copper arsenate must not be used for preservative treatment.

Replace the 2nd sentence of the 1st paragraph of section 57-2.03B(3) with:

10-30-15

The wire rope must be furnished with Class A weight zinc-coated wire under ASTM A603.

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

02-12-16

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 "Type S" in the 2nd paragraph of section 59-1.02A with:

01-15-16

Type M or Type S

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:

02-12-16

Clean and paint all exposed structural steel and other metal surfaces.

Cleaning and painting of new structural steel must be performed in an Enclosed Shop as defined in AISC-420-10/SSPC-QP 3.

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

11-15-13

Reserved

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.

^^^

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

^^

68 SUBSURFACE DRAINS

04-18-14

Replace the 5th paragraph of section 68-4.02E with:

04-18-14

HMA for backfilling trenches must comply with HMA for miscellaneous areas as specified in section 39.

^^

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

^^^

Replace the row under "Rock class" in the table in the 2nd paragraph of section 72-3.03E with:

01-20-12

1/2 T	1/4 T	Light	Facing	Cobble

07-19-13

Delete the 5th and 6th paragraphs of section 72-11.01B.

Add to section 72-11.01B:

01-18-13

Expanded polystyrene and premolded expansion joint filler must comply with section 51-2.

07-19-13

Delete the 2nd paragraph of section 72-11.01C(1).

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

10-30-15

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 the 7th paragraph of section 75-1.03F with:

10-30-15

Before applying any nonskid material, demonstrate the method of application to the Engineer by preparing a 1-sq ft test sample applied on hardboard at least 1/4 inch thick. The nonskid surface must have a total thickness from 1/8–3/16 inch.

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

07-18-14

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.

07-18-14

Delete "resisting moment" and its definition in section 80-3.01B.

Add to section 80-3.01B:

07-18-14

posts and braces: Framework that supports the metal fabric for chain link fence. Posts and braces include round and roll-formed cross sections used as line, end, latch, or corner posts and braces.

Add to section 80-3.01C:

07-18-14

Submit a certificate of compliance for posts and braces that includes the information specified in ASTM F1043, section 9.

07-18-14

Delete section 80-3.01D.

Replace the 1st paragraph of section 80-3.02B with:

07-18-14

The base metal for posts and braces must be commercial-quality, weldable steel complying with AASHTO M 181, Type 1, except for the protective coating requirements.

Posts and braces must comply with the strength requirements in ASTM F1043:

1. Group IA, regular grade, for round posts
2. Group II-L for roll-formed posts and braces

07-18-14

Delete the 4th through 8th paragraphs of section 80-3.02B.

Add between "coating" and "unless" in the 1st sentence of section 80-3.02C:

07-18-14

or ASTM F1345, Class 2,

^^^

Add between "splices at" and "posts" in the 5th paragraph of section 83-1.02B:

07-19-13

midspan between

Replace the 7th paragraph of section 83-1.02B with:

10-30-15

Construct midwest guardrail system using:

1. Wood or steel line posts.
2. Wood blocks for line posts. You may use plastic blocks for steel line posts where shown.
3. Only 1 type of post and block for any 1 continuous length of guardrail.

Replace the 9th paragraph of section 83-1.02B with:

10-30-15

Submit 2 certified copies of mill test reports as an informational submittal for each heat of steel from which the steel posts are formed or fabricated.

10-30-15

Delete "chromated copper arsenate," in the 1st sentence of the 14th paragraph of section 83-1.02B.

Replace "7th paragraph in section 57-2.01B(3)" in the 16th paragraph of section 83-1.02B with:

10-30-15

1st and 2nd paragraphs in section 57-2.01C(3)(b)

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

Replace item 4 in the list in the 25th paragraph of section 83-1.02B with:

07-18-14

4. For the connection of guard railing to new bridge railing or barriers, anchor bolt holes must be drilled in the concrete parapet or formed using metal or PVC sleeves.

07-19-13

Delete items 6 and 7 in the list in the 25th paragraph of section 83-1.02B.

10-30-15

Delete "A 441," in item 5 in the list in the 26th paragraph of section 83-1.02B:

Add between "mixture" and "specified" in the 27th paragraph of section 83-1.02B:

10-30-15

for load bearing applications

Replace "Type WB" at each occurrence in section 83-1.02B(2) with:

07-19-13

Type WB-31

Replace "metal" at each occurrence in the 2nd paragraph of section 83-1.02B(2) with:

10-30-15

rail

Replace the heading of section 83-1.02B(3) with:

07-19-13

Temporary Midwest Guardrail System

Replace the 2nd sentence of the 9th paragraph of section 83-1.02D(1) with:

07-18-14

Posts and balusters must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet.

Replace "80-2.02" in the 2nd paragraph of section 83-1.02E with:

10-19-12

80-3.02B

Replace the 3rd paragraph of section 83-1.02G(2) with:

07-18-14

Stud bolts must comply with the specifications for studs in clause 7 of AWS D1.1.

Replace the 7th paragraph of section 83-1.02G(2) with:

10-30-15

For tubular hand railing and tubular lower rail mounted on Type 80SW concrete barrier:

1. Resin capsule anchors and threaded rods must comply with section 75-1.03
2. Drilling and bonding threaded rods must comply with the specifications for drilling and bonding dowels in section 51-1

Replace "horizontal" in the 8th paragraph of section 83-1.02G(2) with:

07-18-14

vertical

Replace the 10th paragraph of section 83-1.02G(2) with:

10-30-15

For tubular handrailings on Type 80SW concrete barriers, submit 2 copies of threaded rod layouts before placing barrier reinforcement.

10-30-15

Delete the 15th paragraph of section 83-1.02I.

Replace the 1st sentence of the 1st paragraph of section 83-1.03 with:

11-15-13

Except for guardrail within the pay limits of a terminal system, a transition railing (Type WB-31), an end anchor assembly, or a rail tensioning assembly, midwest guardrail system is measured along the face of the rail element from end post to end post of the completed railing.

Add between the 1st and 2nd paragraphs of section 83-2.01:

10-30-15

Concrete barrier work includes:

1. Bar reinforcing steel, including the length that extends from the barrier into decks, walls, and footings
2. Constructing steel plate barriers at overhead sign foundations, electroliers, drainage structures, and other locations shown

10-30-15

Delete the 2nd paragraph of section 83-2.01.

Replace "Reserved" in section 83-2.02A with:

10-30-15

Markers must comply with section 82.

Replace the 4th paragraph of section 83-2.02B with:

10-30-15

Use wood blocks with wood and steel posts. You may use plastic blocks with steel posts where shown.

Replace the 7th paragraph of section 83-2.02B with:

10-30-15

Threaded rods must comply with ASTM A 307. Anchor bolts must comply with ASTM F 1554, Grade 55.

Add between the 8th and 9th paragraphs of section 83-2.02B:

10-30-15

Trim existing median plantings to clear the work area for thrie beam barrier construction. Dispose of trimmings.

Replace "metal" at each occurrence in the 3rd paragraph of section 83-2.02B(2) with:

10-30-15

rail

Add between "roadway" and ", except" in the 4th paragraph of section 83-2.02B(2):

10-30-15

at authorized locations

Replace the 15th paragraph of section 83-2.02D(1) with:

10-30-15

The tubular handrailing and tubular lower rail for Type 80SW concrete barrier must comply with the specifications for tubular handrailing in section 83-1.02G(2).

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

Replace the 1st paragraph of section 83-2.02D(2) with:

10-30-15

Construct Type 50 and 60 series concrete barriers of minor concrete, except as follows:

1. Concrete must contain not less than 550 pounds of cementitious material per cubic yard.
2. Maximum size of aggregate used for extruded or slip formed concrete barrier must be no larger than 1-1/2 inches and no smaller than 3/8 inch.
3. If the 3/8-inch maximum size aggregate grading is used to construct extruded or slip formed concrete barrier, the concrete must contain not less than 675 pounds of cementitious material per cubic yard.

Replace the 2nd paragraph of section 83-2.02D(2) with:

10-30-15

In non-freeze-thaw areas, concrete for concrete barriers other than Type 50 and 60 series must contain not less than 590 pounds of cementitious material per cubic yard.

Add to section 83-2.02:

10-19-12

83-2.02H–83-2.02M Reserved

Add between the 2nd and 3rd paragraphs of section 83-2.03:

10-30-15

The payment quantity for single thrie beam barrier is the length measured from end post to end post along the face of the rail element of the installed barrier. The quantity does not include any portion of single thrie beam barrier within the pay limits of transition railing (Type STB).

Add to the end of the 4th paragraph of section 83-2.03:

10-30-15

The quantity does not include any portion of double thrie beam barrier within the pay limits of transition railing (Type DTB).

Replace the 10th paragraph of section 83-2.03 with:

10-30-15

The payment quantity for concrete barriers includes the length of gaps in the concrete barrier where steel plate barrier is attached to the concrete barrier.

^^

84 TRAFFIC STRIPES AND PAVEMENT MARKINGS

05-30-14

Replace section 84-1.01C with:

05-30-14

84-1.01C Submittals

For glass beads used in drop-on applications and in thermoplastic formulations, submit a certificate of compliance and test results for each lot of beads specifying the EPA test methods used and tracing the lot to the specific test sample. The testing for lead and arsenic content must be performed by an independent testing laboratory.

Submit retroreflectivity readings for traffic stripes and pavement markings at locations with deficient retroreflectivity determined by the Engineer.

84-1.01D Quality Control and Assurance

Test each lot of glass beads for arsenic and lead under EPA Test Method 3052 and 6010B or 6010C.

Applied traffic stripes and pavement markings must be retroreflective. Within 30 days of applying traffic stripes and pavement markings, the retroreflectivity of the stripes and markings must be a minimum of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$ for white and 125 $mcd \cdot m^{-2} \cdot lx^{-1}$ for yellow when measured under ASTM E1710.

The Engineer will perform a nighttime, drive-through, visual inspection of the retroreflectivity of the traffic stripes and pavement markings and notify you of any locations with deficient retroreflectivity. Measure the retroreflectivity of the deficient areas using a retroreflectometer under ASTM E1710 and the sampling protocol specified in ASTM D7585.

Replace the paragraph in section 84-1.02 with:

05-30-14

Glass beads applied to paint must comply with State Specification 8010-004.

Glass beads applied to molten thermoplastic material must be Type 2 beads complying with AASHTO M 247. The glass beads must have a coating that promotes adhesion of the beads to thermoplastic.

At least 75 percent of the beads by count must be true spheres that are colorless and do not exhibit dark spots, air inclusions, or surface scratches when viewed under 20X magnification.

Each lot of glass beads used in pavement markings must contain less than 200 ppm each of arsenic and lead when tested under EPA Test Method 3052 and 6010B or 6010C.

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

10-17-14

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 sentence of the 15th paragraph of section 86-2.05C with:

11-15-13

Conduit runs shown to be located behind curbs may be installed in the street within 3 feet of and parallel to the face of the curb by the trenching in pavement method.

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)

Replace the paragraphs in section 86-4.03J with:

10-17-14

Reserved

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 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, ℃	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

Replace 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

^^

94 ASPHALTIC EMULSIONS

03-21-14

Replace the 1st paragraph of section 94-1.04 with:

03-21-14

Asphaltic emulsion is measured by weight under the specifications requiring its use. If water is added to the asphaltic emulsion, the quantity of asphaltic emulsion is determined before the addition of water.